VOLUME XLV NUMBER ONE

# THE NATIONAL GEOGRAPHIC MAGAZINE

JANUARY, 1924

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ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resultant given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

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THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purchase was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

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THE Society also is maintaining expeditions in the unknown area adjacent to the San Juan River in southeastern Utah, and in Yunnan, Kweichow, and Kansu, China—all regions virgin to scientific study.

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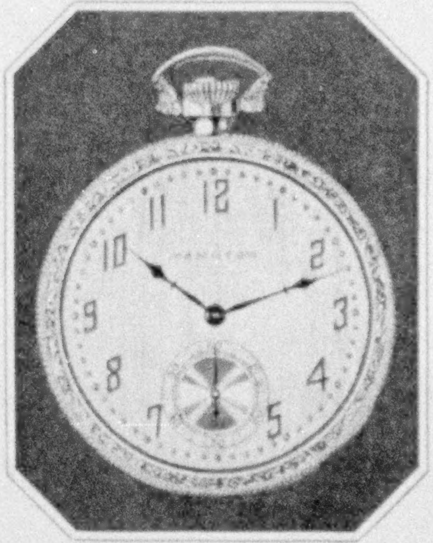

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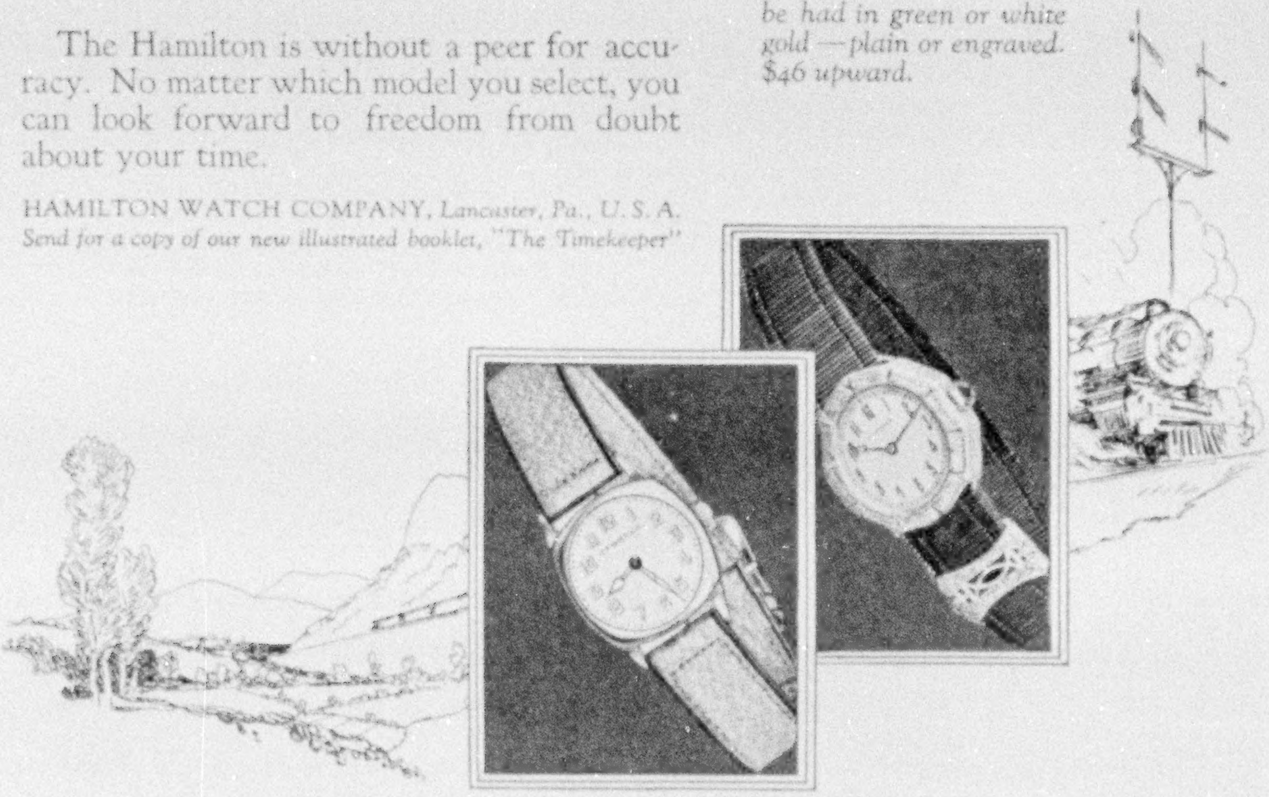

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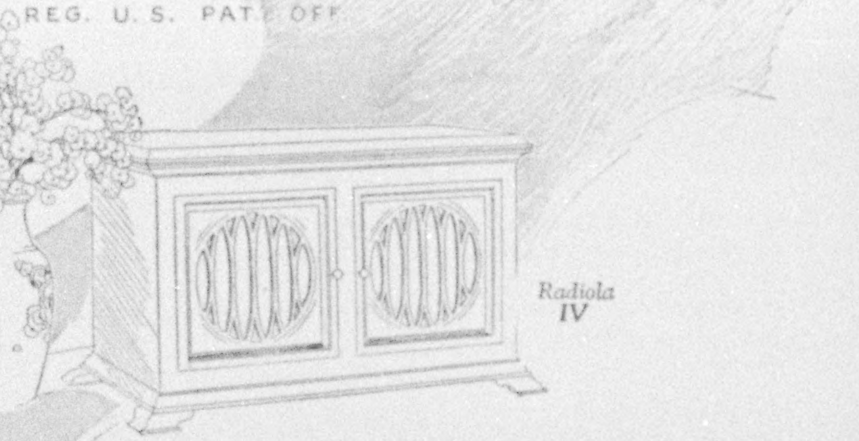
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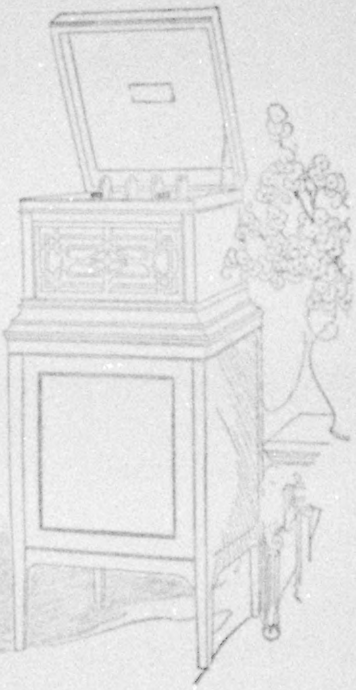
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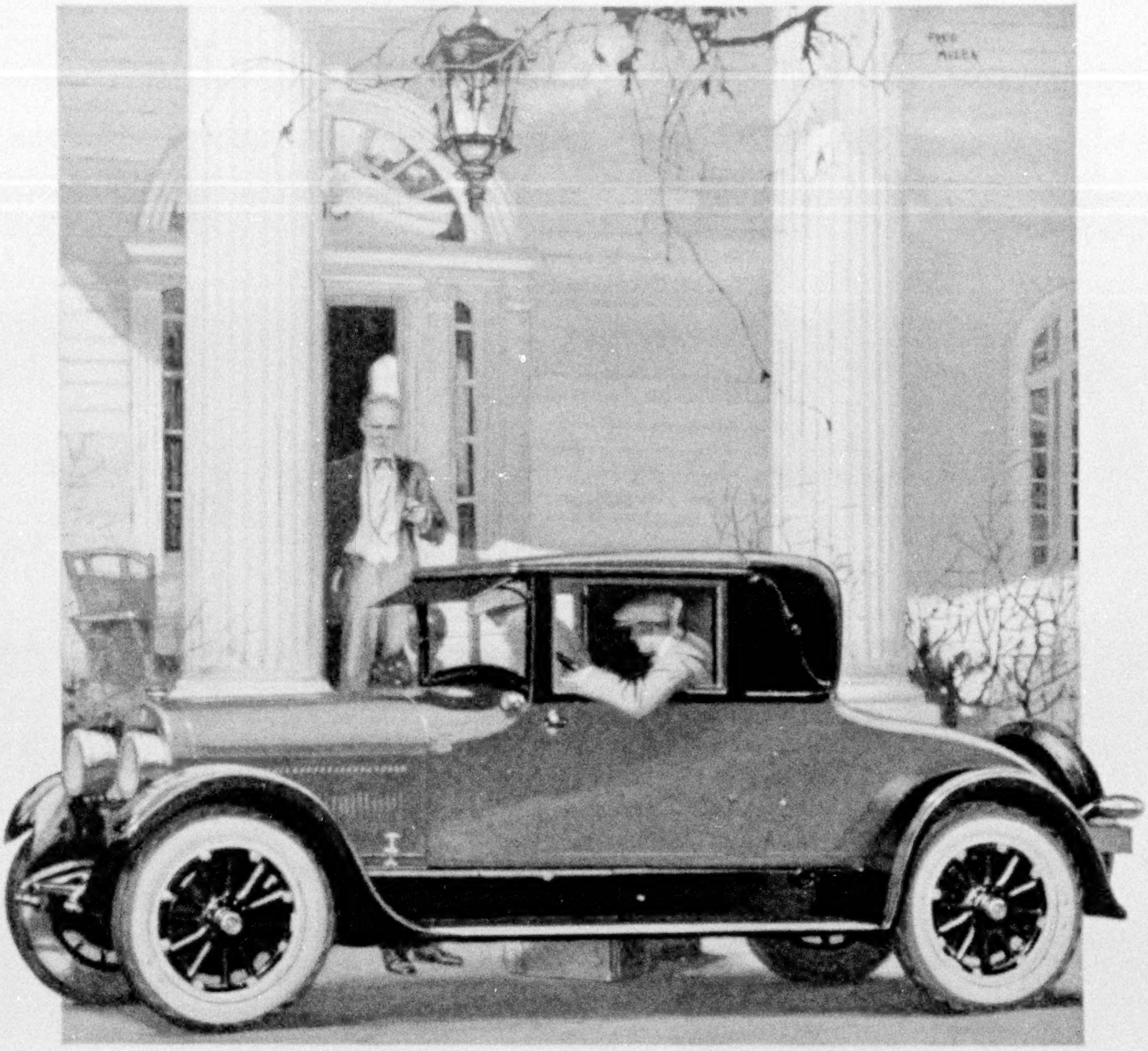

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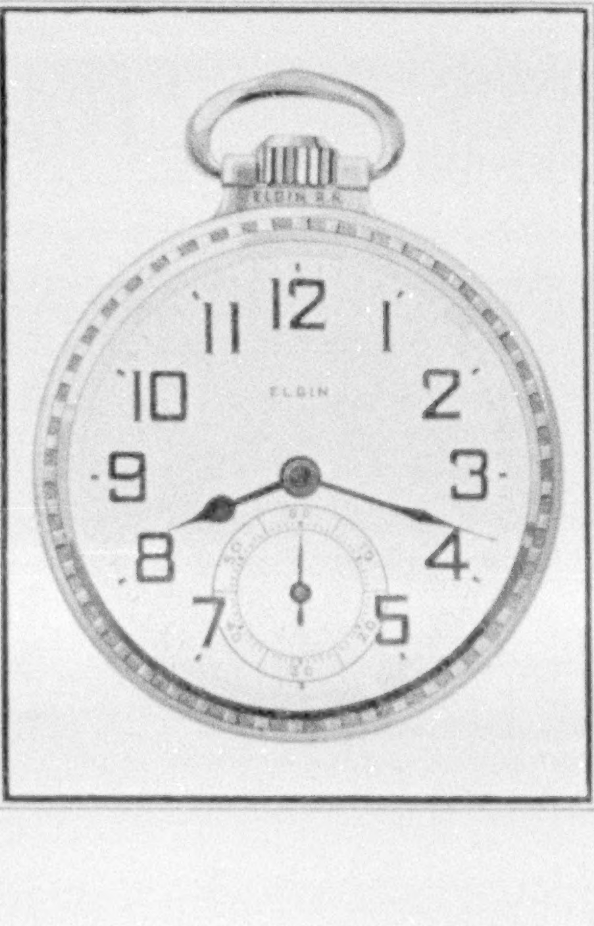

*Dial*—fine enamel. Large, clear figures. Wide reflector. Correct time visible at a glance in any light.

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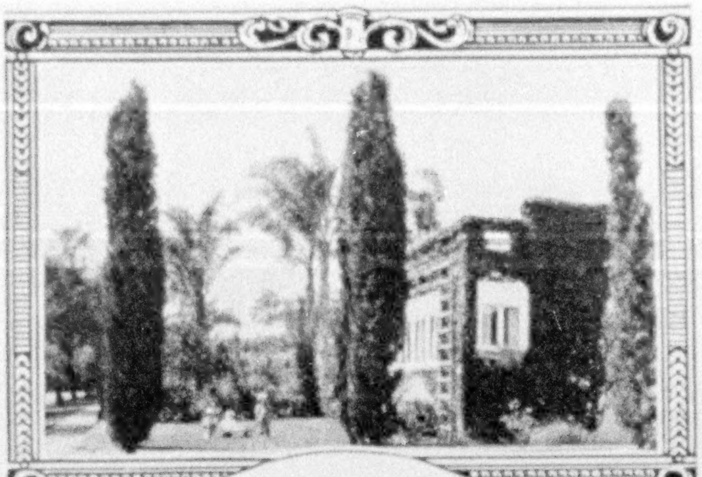

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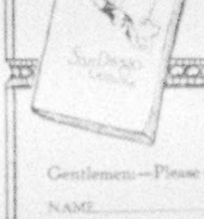

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From this time, all Packard cars will be equipped with four-wheel brakes.

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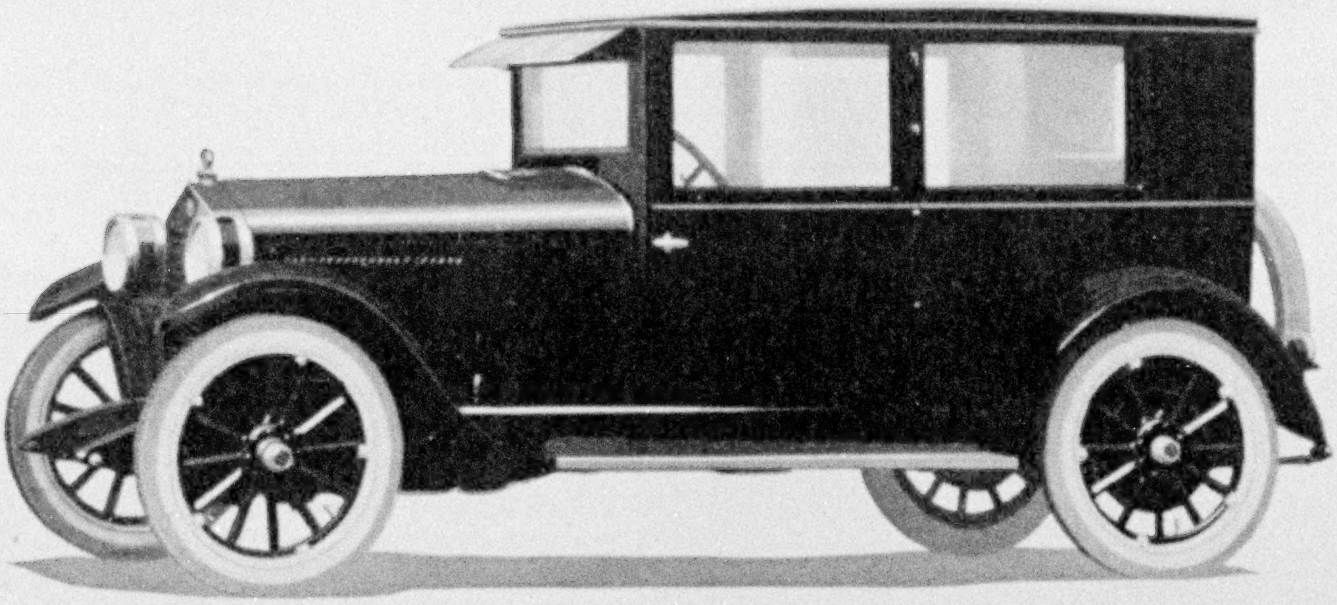

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Mr. Cody finally evolved a new invention, on which he was allowed a patent. This invention was tried out in the schools of two western cities; it was tried out by big corporations; it was tested with thousands of individuals. The results universally showed greater improvement in English in SIX WEEKS than was often secured in TWO YEARS by old methods.

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THE Earthquake disaster was confined solely to Yokohama, Tokio and a small eastern section of the island. Kobe and the whole western part of the island is and has always been out of the earthquake zone. Passengers to the Orient and return can now view the ruins in perfect safety either from the shore or ship. Accommodations in Kobe are perfect and rail communications with Tokio are established.

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| Pres. Grant | Feb. 2 | Pres. Wilson | Feb. 7 |
| Pres. Madison | Feb. 14 | Pres. Pierce | Feb. 21 |
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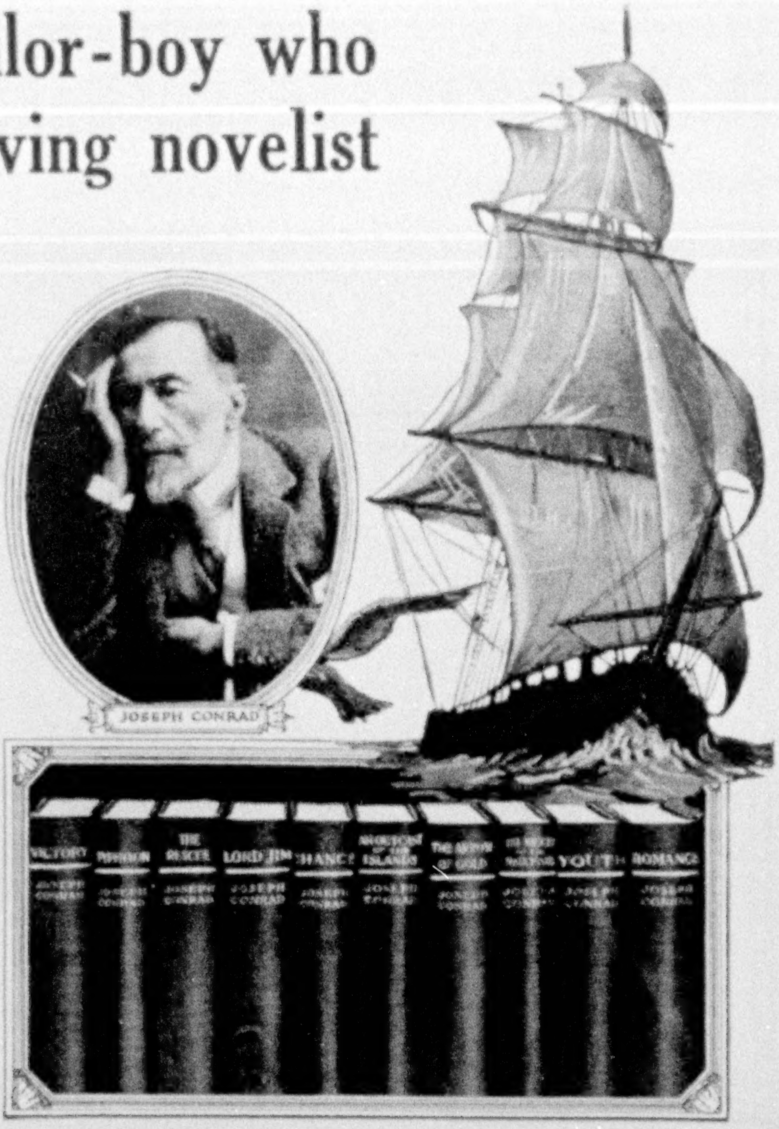
# The romantic little sailor-boy who became the greatest living novelist

Nothing that Joseph Conrad himself has written is more filled with romance than the amazing story of his own life. How a spirited Polish lad with a longing for the sea rose to a pre-eminent place in the world's literature is an incredible narrative woven out of the slender threads of chance.



A LITTLE boy in Poland placed his finger upon a map of the world and said, "I shall go there." He had pointed to the Congo, in darkest Africa. And years later he went to the Congo.

He had an inborn desire for the sea, this sensitive child of an inland race. In 1874, at the age of seventeen, he went to Marseilles and shipped before the mast aboard a sailing vessel. For twenty years thereafter the open sea was his home.

Of all the amazing facts of Joseph Conrad's life perhaps the most amazing is this: That until he was past twenty he had never spoken a word of English; nor until he was past thirty had he written his first story!

Yet, today, this former impressionable cabin-boy is acclaimed—not only by the public, but by other writers themselves—as the foremost living English novelist. At the right are reproduced the words of some of the foremost authors of today—words filled with sincere admiration for the work of this great master. And all over the world tens of thousands of Conrad lovers echo their seemingly uncontrollable praise. The "Conrad fever" has become epidemic; everywhere men and women are eagerly reading and re-reading his books. As Gouverneur Morris says: "He is becoming necessary to contemporary education."

## JOSEPH CONRAD SPECIAL 1924 OFFER

What magic is there in Conrad to account for this unexampled enthusiasm? His is an astonishing combination of gifts, quite indescribable. "His books have no counterpart in the entire range of English literature," says Sir Hugh Clifford.

Here is romance, adventure, chance—the mystery of distant places—and, above all, the haunting spell of the sea. "All the majesty of illimitable oceans, all the charm of the mysterious southern seas, all the adventure and dark passions of unknown lands and races—all these Conrad gives us, as no other ever has and no other ever can!"

### Now the opportunity that Conrad lovers have clamored for

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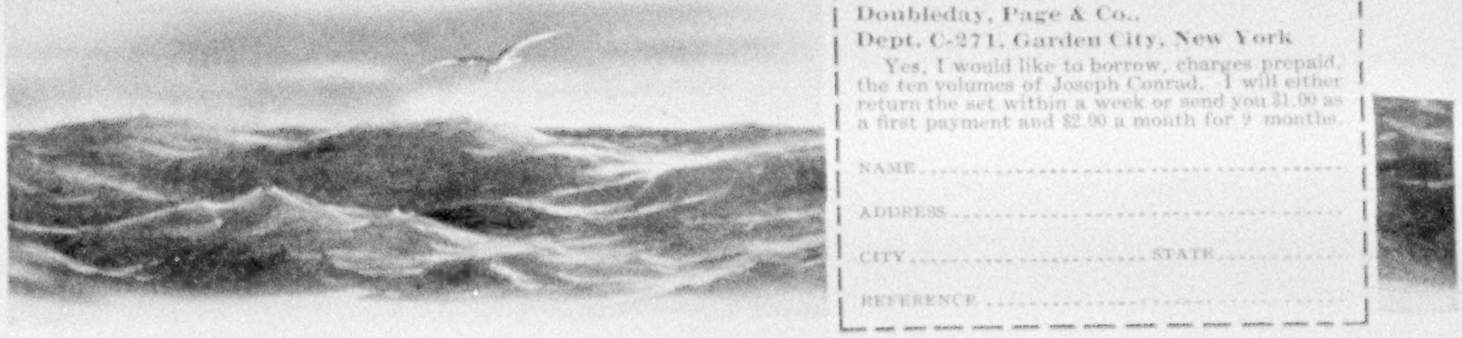

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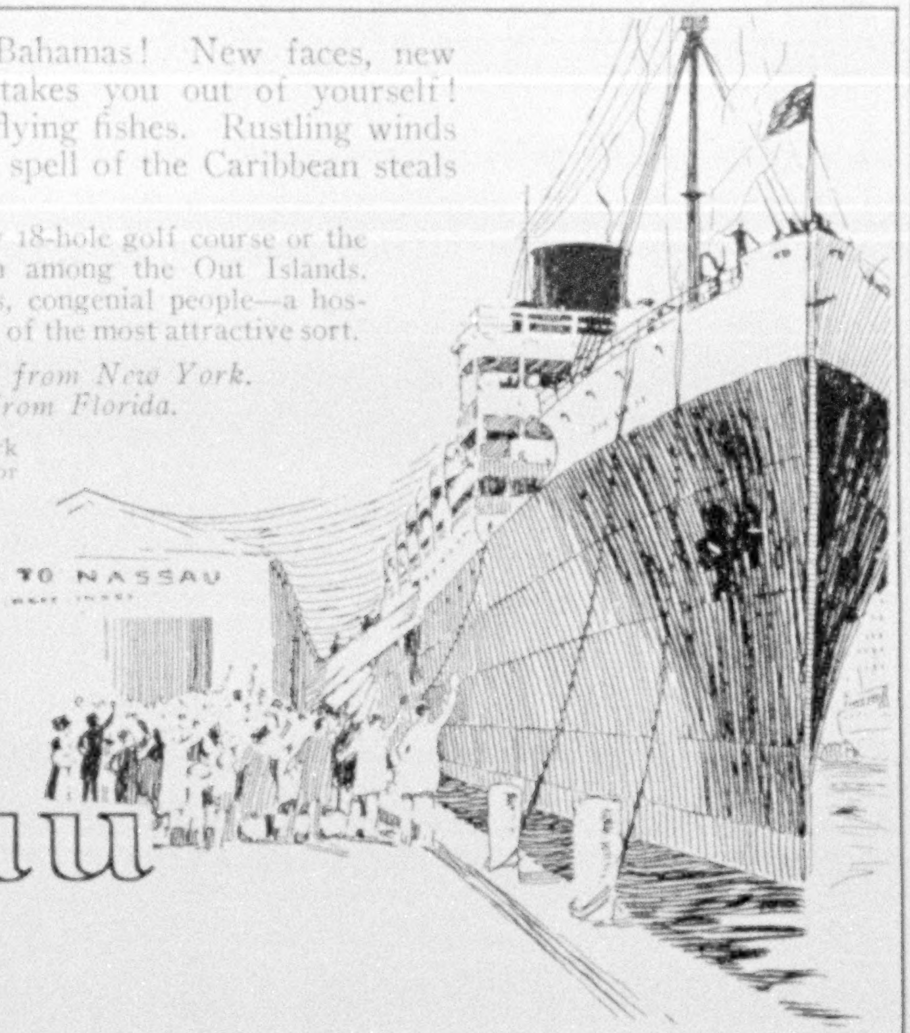

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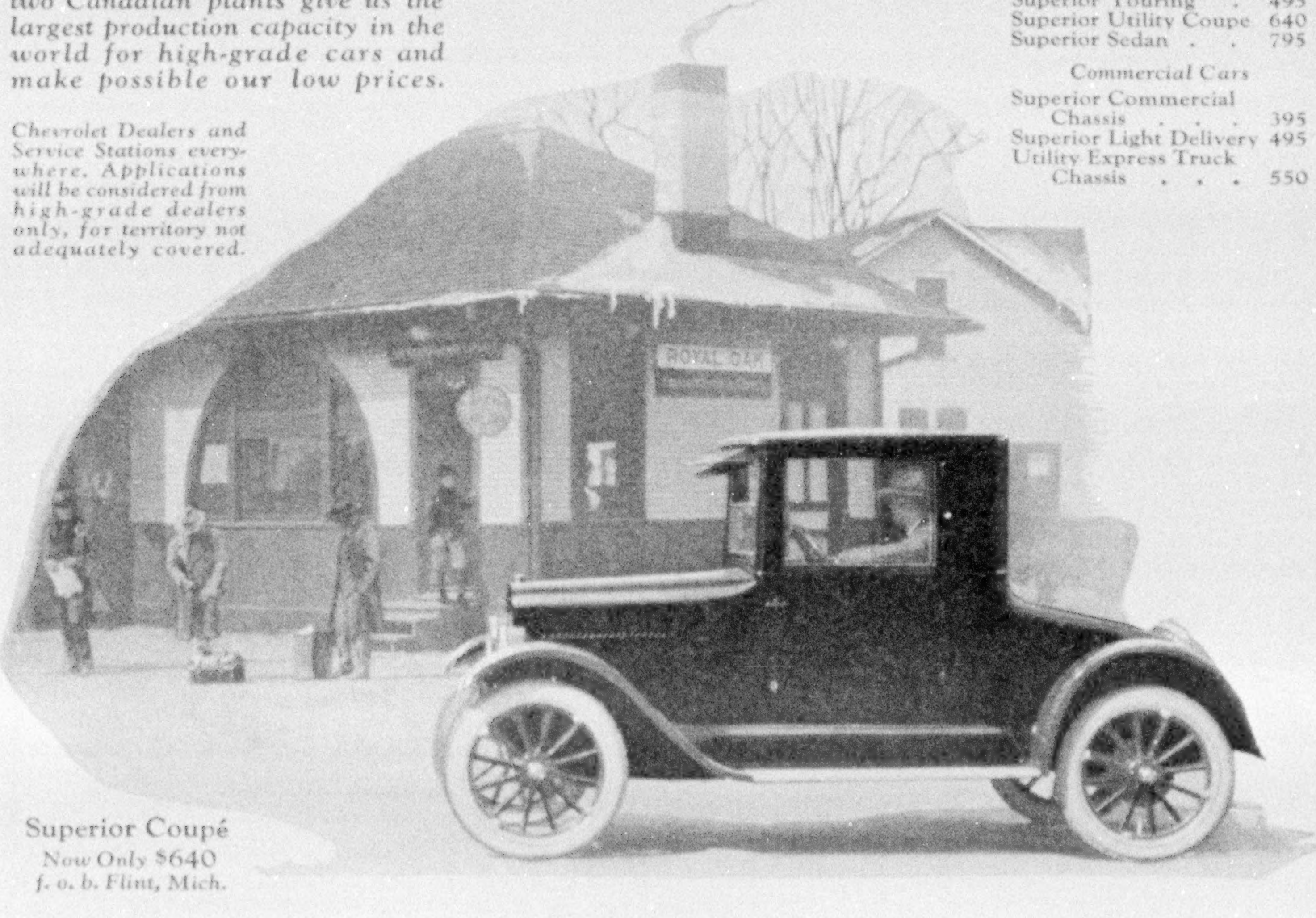

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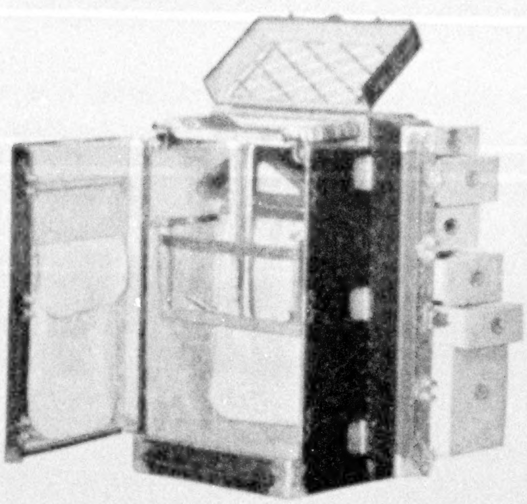

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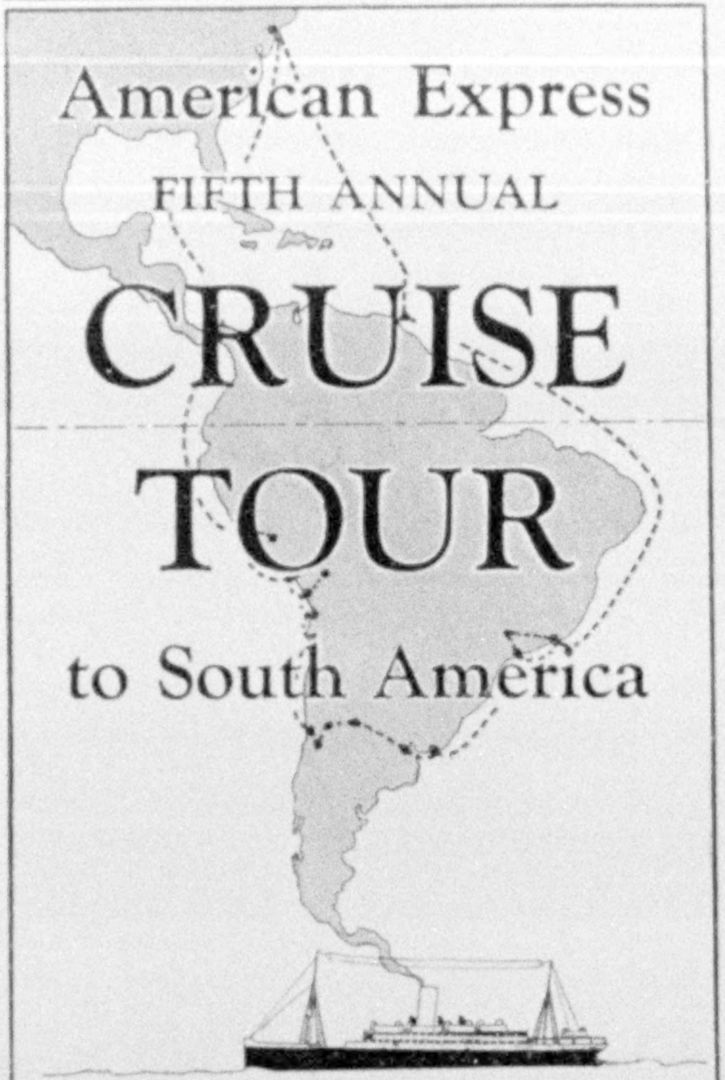

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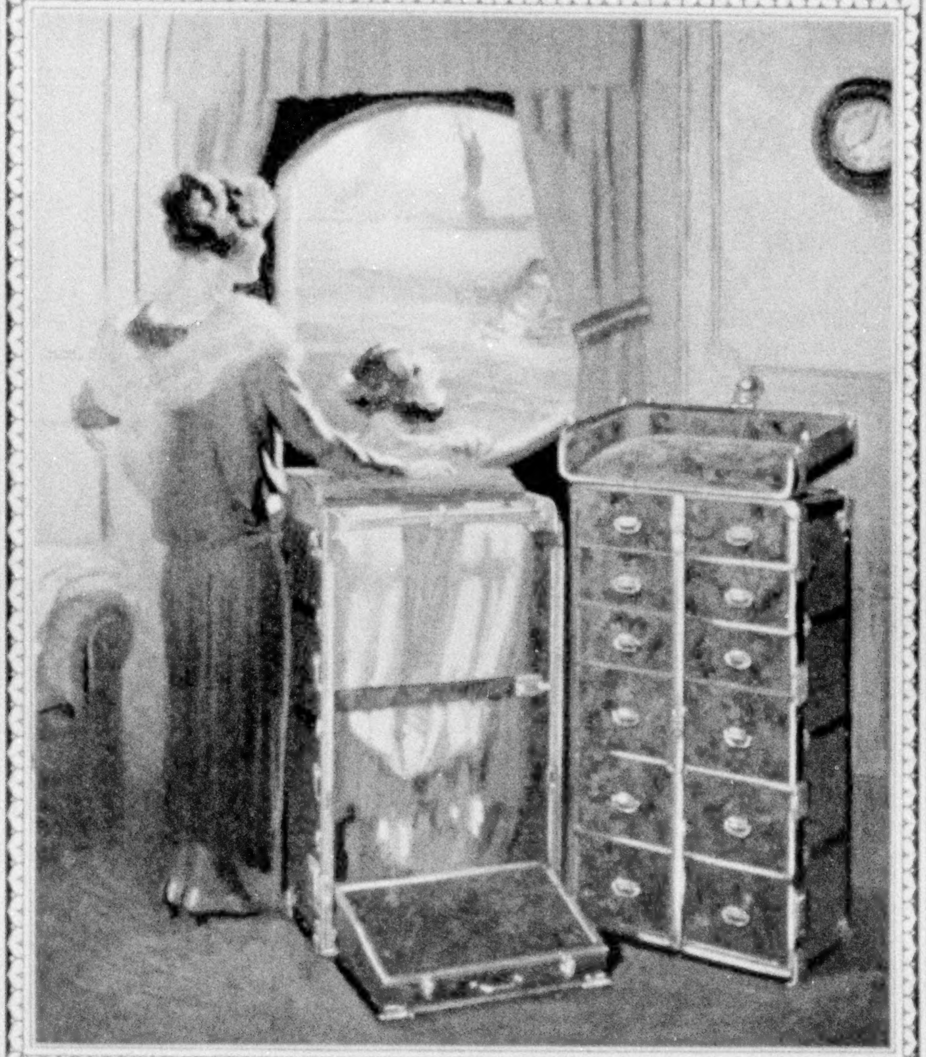

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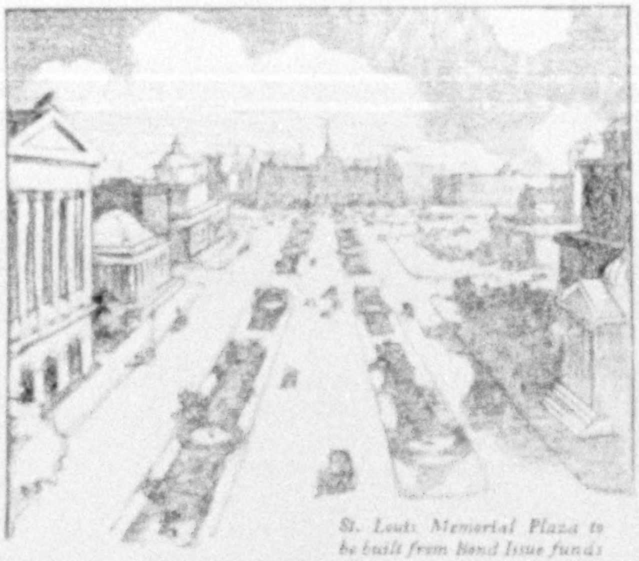

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MORE than $450,000,000 will be spent in St. Louis by private enterprises as a result of the expenditure by the city of $87,372,500 for public improvements from bond issue funds. This typifies the spirit of St. Louis in which the people are working together for the community's advancement.

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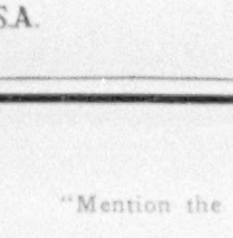

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# A Queer Human Kink

WHAT strange bundles of contradictions we all are! We tell each other earnestly that health is one of the most precious things in life—and yet what do we do to keep it, to protect it? It's a queer kink in human nature, isn't it, to *think* one way and *act* just the opposite!

## *The Harm of Self-Diagnosis*

You know how idle people love to talk over symptoms and recklessly recommend all sorts of cure-all remedies.

What a tremendous amount of harm is done by attempts at self-diagnosis! Here is an example: A prominent man made up his mind that he was eating too much meat and heroically put himself on a strict diet. Sometime later, he was taken ill. His doctor astonished him by saying that while most men of his age would have benefited by doing what he had done, his case was an exception and that *lack* of meat caused the trouble.

## *How Long Do You Want To Live?*

Just so long as you are well and happy? Good!—but suppose you keep right on living long after you have ceased to be well!

Stop right here and think about it.

You would not treat your car as you treat yourself. You constantly test the steering gear and the brake bands. You make sure that bolts are tight. You listen to the motor for the faintest "knock". You are careful about the fuel mixture—it must not be too rich nor too lean or the engine will not pull properly.

But do you know whether the food—the "fuel mixture"—that you give your own body is too rich or too lean? You can replace parts of your car, but you can't replace a worn-out heart, an abused stomach, an over-worked liver or frayed nerves.

## *Years Alone Do Not Age Us*

The physical changes ascribed to age may be due to poison, infection, wrong food or emotional strain, principally worry. And these things are in large degree under our own control.

Go to your wisest adviser, your own good friend, your Doctor, within the next few days, and have a *thorough* examination. If you are well, you will be glad to have his O. K. And if he finds some slight defect, be thankful that it can be corrected in time—before it becomes serious.

Begin the New Year right!

THE LIGHT THAT NEVER FAILS

The Metropolitan Life Insurance Company believes thoroughly in the value of the annual physical examination. All of the 8,000 employees of the Home Office are carefully examined each year; also its field force of nearly 20,000 employees. These examinations are carefully followed up and those employees who show impairments receive particular attention. The result of such intensive care is very gratifying.

During the past ten years, the Company has arranged for the examination of various classes of its policyholders and is extending this privilege every year.

In the first 6,000 policyholders examined, a remarkable lowering of mortality occurred. Instead of 303 deaths in the five and one-half years subsequent to the examination, only 217 occurred—a saving of 28 per cent. in the expected mortality.

It is not difficult to understand why this should happen. Many of the policyholders who had been examined did not know that they were impaired. They took the advice of the physicians seriously; they followed instructions and thereby averted serious trouble.

The great waste of life that still prevails can be prevented. If people will make an annual inventory of their physical condition and will follow the advice of trained physicians and live hygienically, they will add whole years to their working lives.

The Metropolitan Life Insurance Company will be glad to mail you, without charge, a booklet entitled, "An Ounce of Prevention". It will help you in guarding that most precious possession—your health.

HALEY FISKE, *President*

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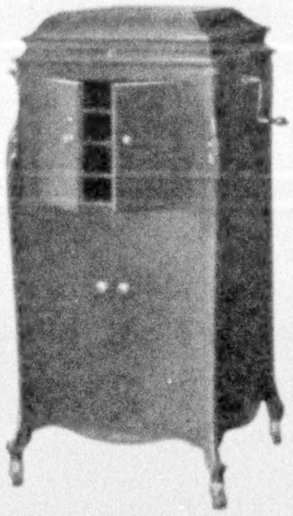
Victor Artist

The forty-three records by Martinelli listed in the Victor Record catalog are the authentic interpretations of this great tenor. They are Martinelli himself—every record carries with it his own personal approval. His selections include:

| | Double-faced | |
|---|---|---|
| Eugene Onegin—Air di Lenski<br>L'Ultima Canzone | 6195 | $2.00 |
| Ernani—Come rugiada al cespite<br>Iris—Apri la tua finestra | 737 | 1.50 |
| William Tell—O muta asil del pianto<br>Traviata—Dei miei bollenti spiriti | 6212 | 2.00 |



Victrola No. 111
$225
Electric, $265
Mahogany or walnut

BORI
Victor Artist

There's a charm to Bori's every interpretation that is most delightful, and it is depicted with absolute fidelity on Victor Records. This life-like quality is readily apparent to the artist herself—to every one upon hearing any of her twenty-five records. Among them are:

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|---|---|---|
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| Malagueña<br>Clavelitos | 544 | 1.50 |

Victrola No. 260
$150
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DE LUCA
Victor Artist

Whatever De Luca sings, his performance is perfection itself and he finds every self-same quality reflected in his Victor Records. Thirty-one numbers have been recorded to date. Here are some of them:

| | Double-faced | |
|---|---|---|
| Barbiere di Siviglia—Largo al Factotum<br>Ernani—O de' verd' anni miei | 6077 | $2.00 |
| William Tell—Resta immobile<br>Marriage of Figaro—Se vuol ballare? | 596 | 1.50 |
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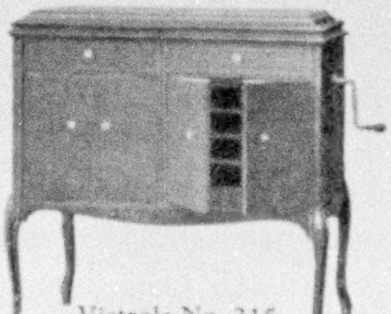

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The Victor Company originated the modern talking machine and was the first to offer the public high-class music by great artists. Victor Supremacy began then. It has been maintained by the continuing patronage of the world's greatest musicians and by the merit of Victor Products.

In buying a talking machine, consider that you must choose the Victrola or something you hope will do as well, and remember that the Victrola—the standard by which all are judged—costs no more. The Victrola instrument line includes twenty-one models of the three general types shown at from $25 up. Ask your dealer or write to us for illustrated catalog.

To be sure of Victor Products, see the following trade-marks—under the lid of every instrument and on the label of every record.

"HIS MASTER'S VOICE"

# Victrola

REG. U.S. PAT. OFF.

Look under the lid and on the labels for these Victor trade-marks
Victor Talking Machine Company, Camden, N.J.

VOL. XLV, NO. 1 WASHINGTON JANUARY, 1924

THE NATIONAL GEOGRAPHIC MAGAZINE

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# A VISIT TO CARLSBAD CAVERN

## Recent Explorations of a Limestone Cave in the Guadalupe Mountains of New Mexico Reveal a Natural Wonder of the First Magnitude

By Willis T. Lee

OCCASIONALLY a matter-of-fact statement of a geographic discovery sounds incredible. Such was the case with Jim Bridger's first accounts of the Yellowstone's geysers. The giant Redwoods of California would seem like a fairy-tale setting were a returning traveler to tell of their dimensions for the first time. Only recently a brand-new type of phenomenon, the Valley of Ten Thousand Smokes, Alaska, taxed comprehension until National Geographic photographs authenticated its prankish natural wonders.

Now comes the announcement of a remarkable cavern among the eastern foothills of the Guadalupe Mountains, in southeastern New Mexico—the Carlsbad Cavern, so named for the little town about thirty miles to the northwest.

The less scenic part has been known locally for many years as a bat cave and a source of guano. Recently explorers traversed several miles of its halls and chambers, and some parts of it were found to have such startling magnificence that, on October 25, 1923, by proclamation of President Coolidge, it was set aside as the Carlsbad National Monument.

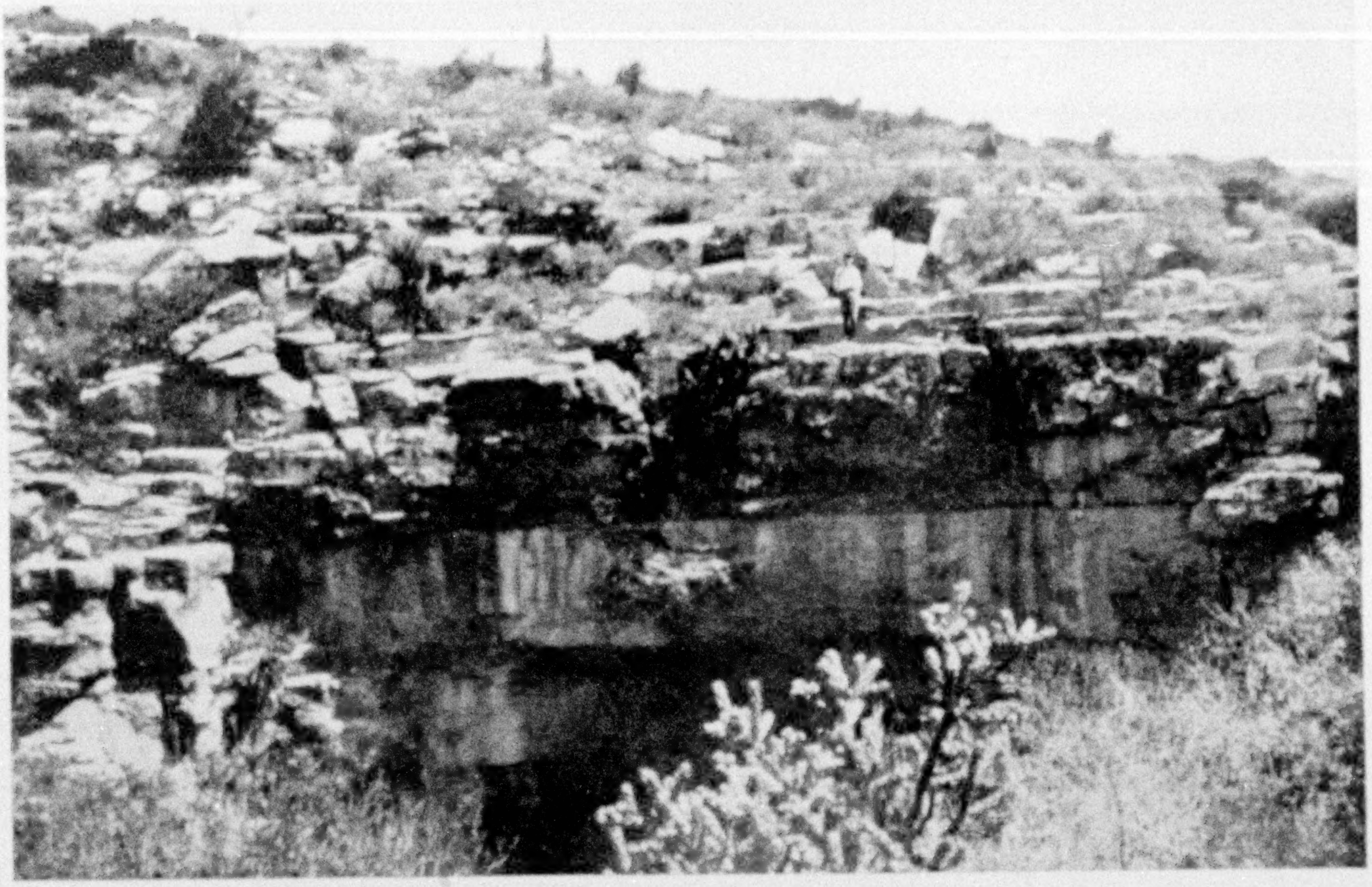
### THE JOURNEY TO THE CAVERN

On the 30-mile ride from Carlsbad to the cave, interest never flags. There is a varied display of prickly pears and melon cactus, and the scraggly leafless stalks of ocotillo. Spanish daggers, Spanish bayonets, and sotol plants (see illustration, page 28) are numerous. Century plants of several varieties are abundant, some forming beautiful rosettes which adorn the hillsides (see illustration, page 27), and others, known as lechuguilla, form mats of closely set spikes covering the surface.

The cavern is reached over a road sadly in need of improvement. Like many of the roads in the sparsely settled Southwest, this one is kept passable by each vehicle following the tracks of the one that has gone before, until the ruts become too deep, when a new route is sought out among the rocks, through the thorny mesquite bushes and over the mats of prickly pear.

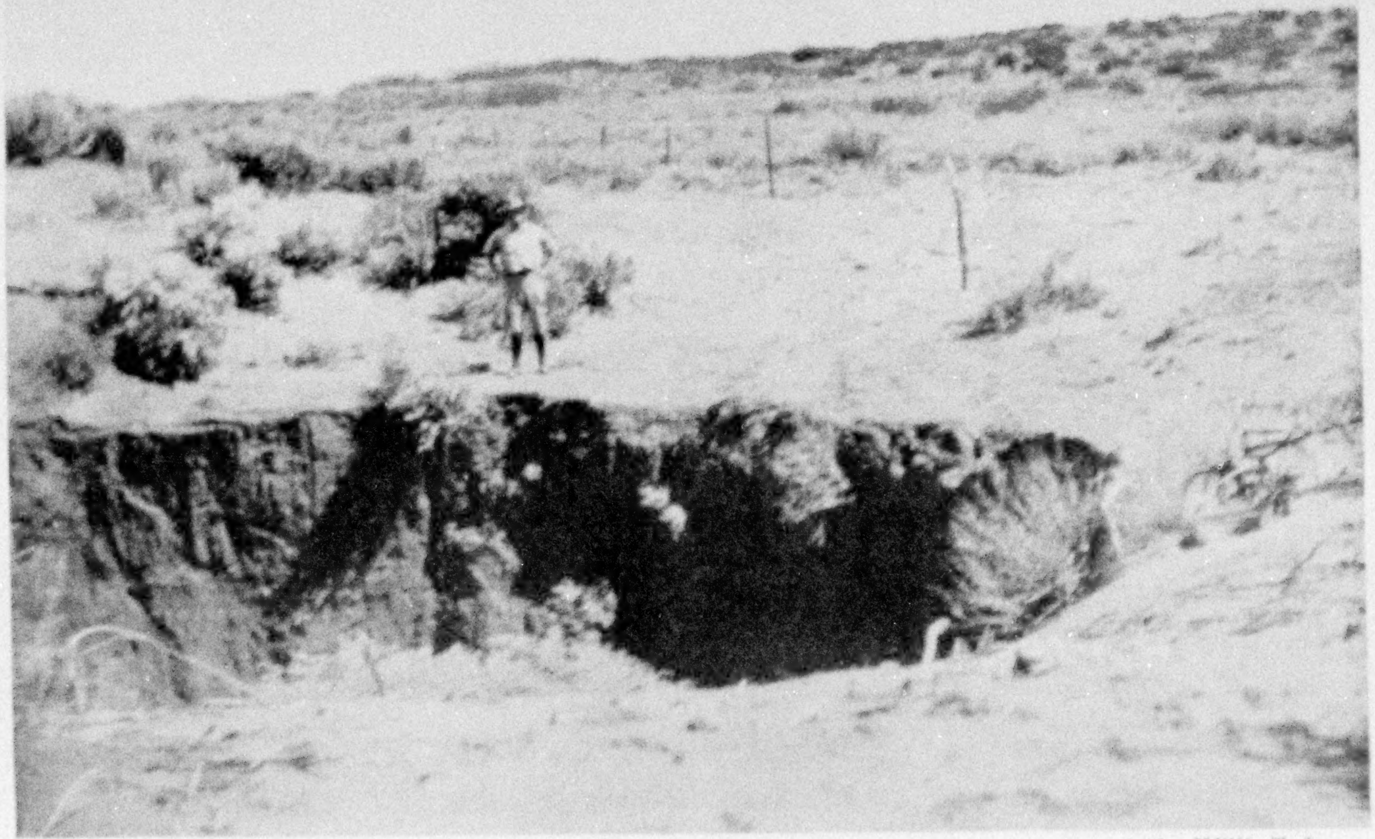
Two hours of jolting into the ruts and out of them brings us to the foot of a steep, rocky slope from which every vestige of soil has been washed away, leaving a barren pavement of limestone. Here the laboring machines come to a halt, while their overheated engines cool, and the much-shaken passengers stretch their cramped limbs and test the strength of the spines that cover a large melon cactus at the side of the road where we alight.

XUM



NATURAL OPENING TO CARLSBAD CAVERN FORMED BY THE COLLAPSE OF THE ROOF

The rocks which once filled this space now lie on the floor of the cave, 170 feet below the surface. The scale is shown by the man standing beyond the opening.



Photographs by Willis T. Lee

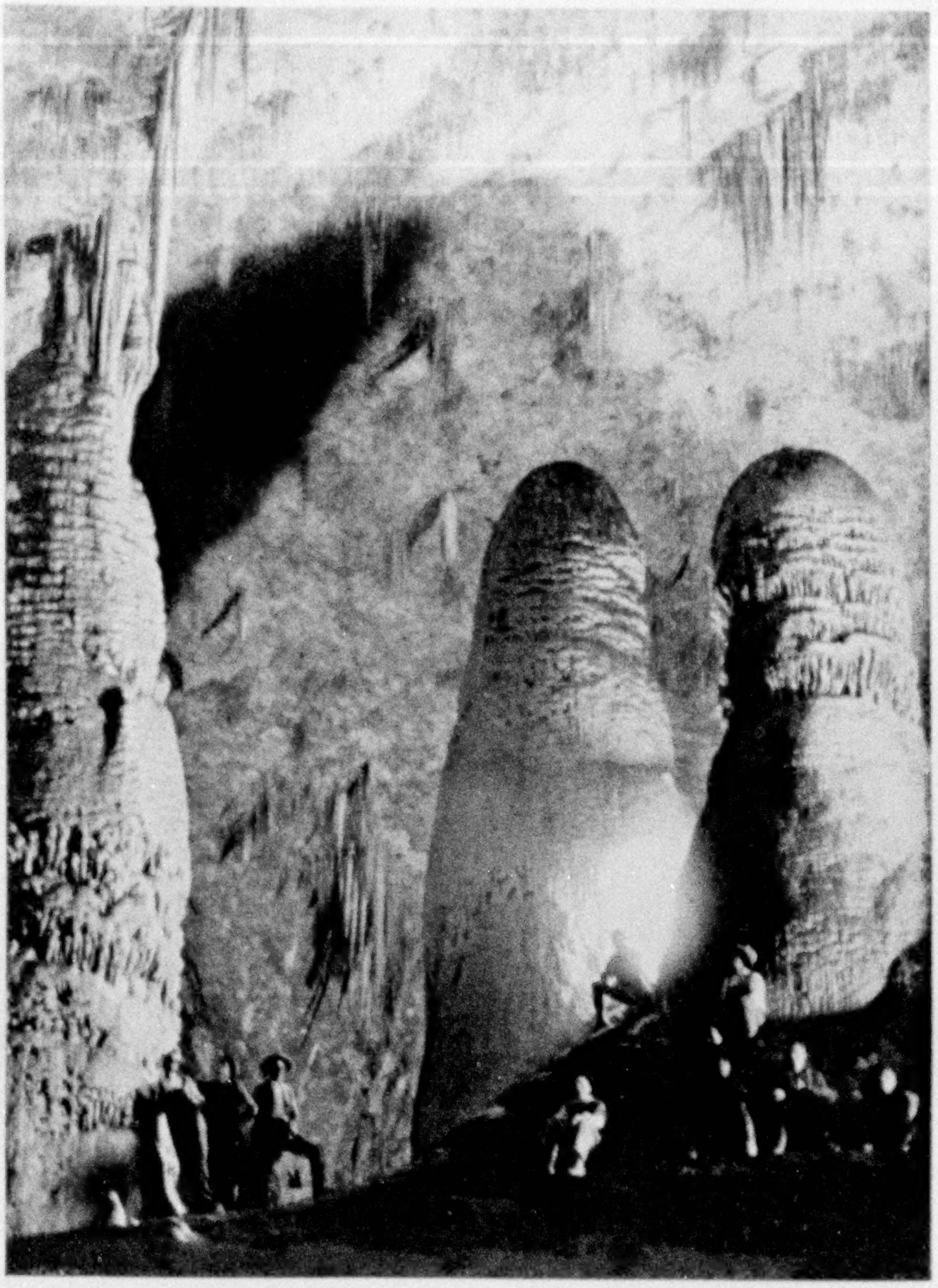
A SINK-HOLE WHERE BEDS OF ROCK-SALT AND GYPSUM UNDERLIE THE SURFACE

This hole, 75 feet across and 60 feet deep, was formed in August, 1918, when a cavern collapsed. A part of the material from this hole now rests in a conical mound on the floor of the cavern; other parts have been distributed through subterranean passageways to find lodgment—who knows where?

Up this rocky slope we must make our laborious way to a bench on the mountain side about 1,000 feet above the valley. Some of the party remain in the jolting machines; others prefer to walk.

### THE CAVERN IS THE HOME OF COUNTLESS BATS

At the entrance to the cave an aspect presents itself for which we are quite unprepared. There are several dwellings, an engine-house, two hoisting shafts, and other evidences of activity. It seems that from prehistoric time the cave has been the home of countless numbers of bats. For several years past quantities of guano have been shipped from it. Although work was not in progress at the time of our visit, the hoisting machine was in working order, and by means of it the descent was safely made.



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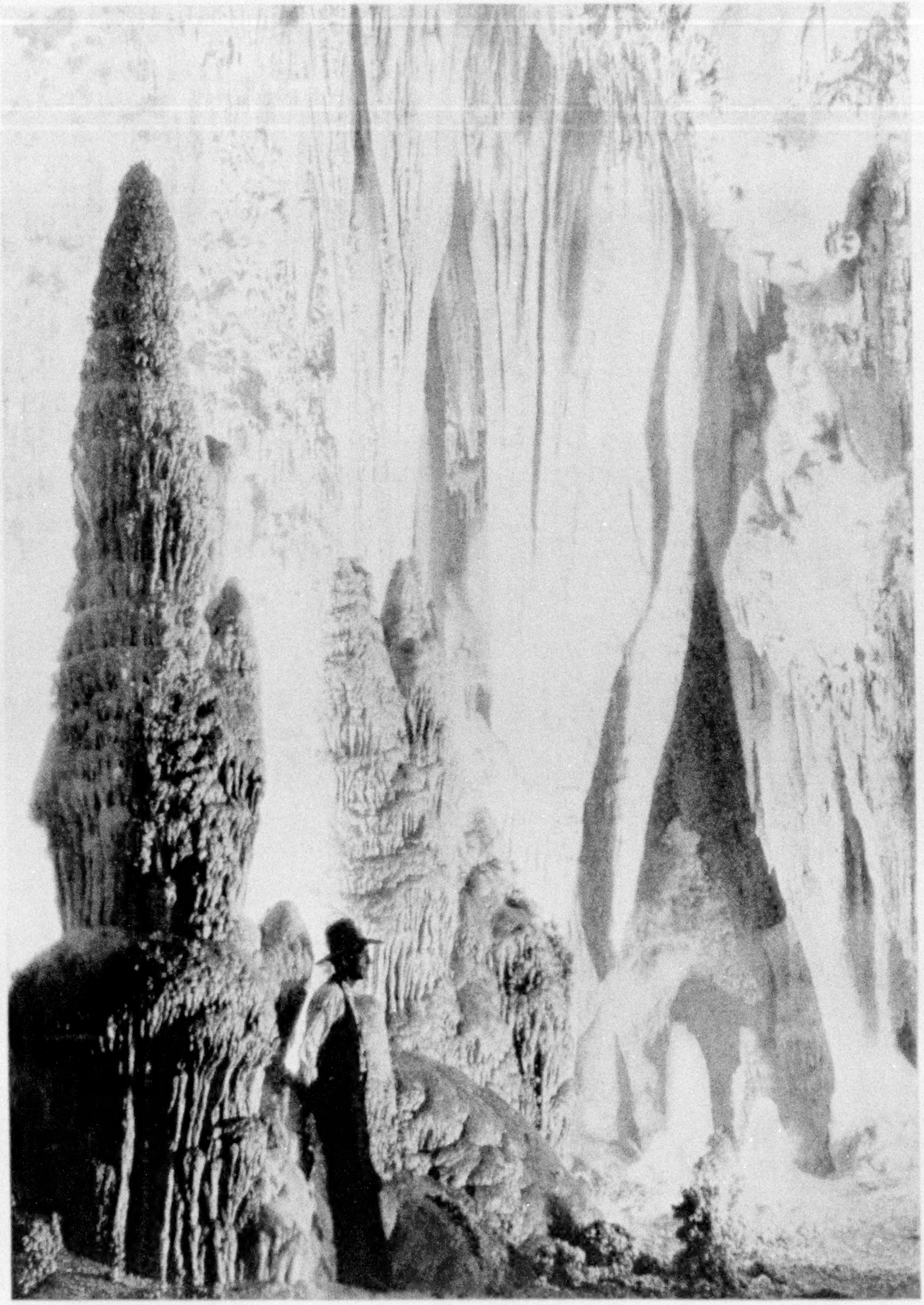
DOMES RISING FROM A WET, SLIPPERY MOUND OF FLOWSTONE

The imaginative explorer faces a scene like this with awe. The eternal darkness, the Titanic proportions, the unbroken silence never interrupted by roll of thunder or more mundane sounds of the outside world, and the equable temperature that defies the seasons' changes—these are a few of the conditions which made caves refuges for men of prehistoric times and caused later races to people these "unearthly" places with gods and fairies.

The natural opening to the cave is not now used and much work must be done before access through it is safe. It consists of a large hole, 100 feet or more across, from which the rocks have fallen into the cavern below, a distance of about 170 feet. This opening widens downward, somewhat like an inverted funnel.

This natural opening is used by the bats. At dusk each evening they begin to leave the cave for their night of foraging. For about three hours the winged stream resembles smoke pouring from a smokestack. Repellent as these little mammals are on close acquaintance, it is fascinating to watch the countless thousands of them leaving home, and to speculate on their destination and the nocturnal adventures awaiting them.

It is equally fascinating in the early morning to watch these same countless thousands returning home; to see each little creature fold its wings in mid-air and dart downward into the cave with incredible speed. Within, each individual seeks its own chosen nook or crack in which it may hook a tiny claw and hang



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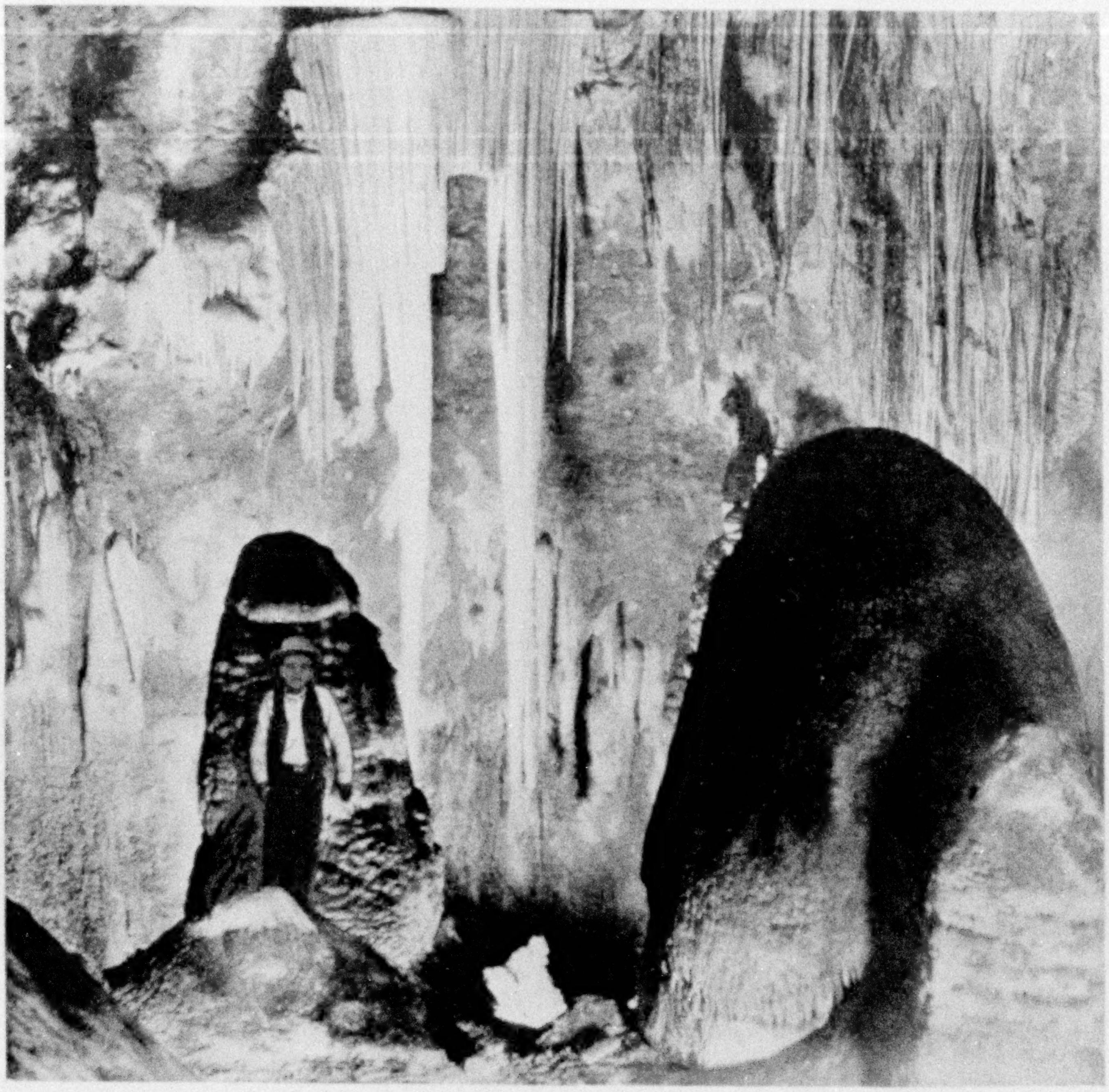
ORNAMENTAL MONUMENTS AND ONYX WALLS, NEAR THE EASTERN END OF THE BIG ROOM (SEE TEXT, PAGE 27)



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FLOWSTONE STALAGMITE SHRINE SURROUNDED WITH PENDANTS OF ONYX

The Pillar of the Constitution, in the Wyandotte Cave, grows .01 to .03 of a centimeter a year. With these figures as a basis, the age of the Pillar has been variously estimated as being from 30,500 to 91,000 years. Other estimates of ages of stalagmites are from 560,000 to 600,000 years. As yet, Carlsbad Cavern has not been studied thoroughly enough for any accurate estimates of its age to be made, but since the stalagmites are much larger it is reasonable to believe that their age is much greater.

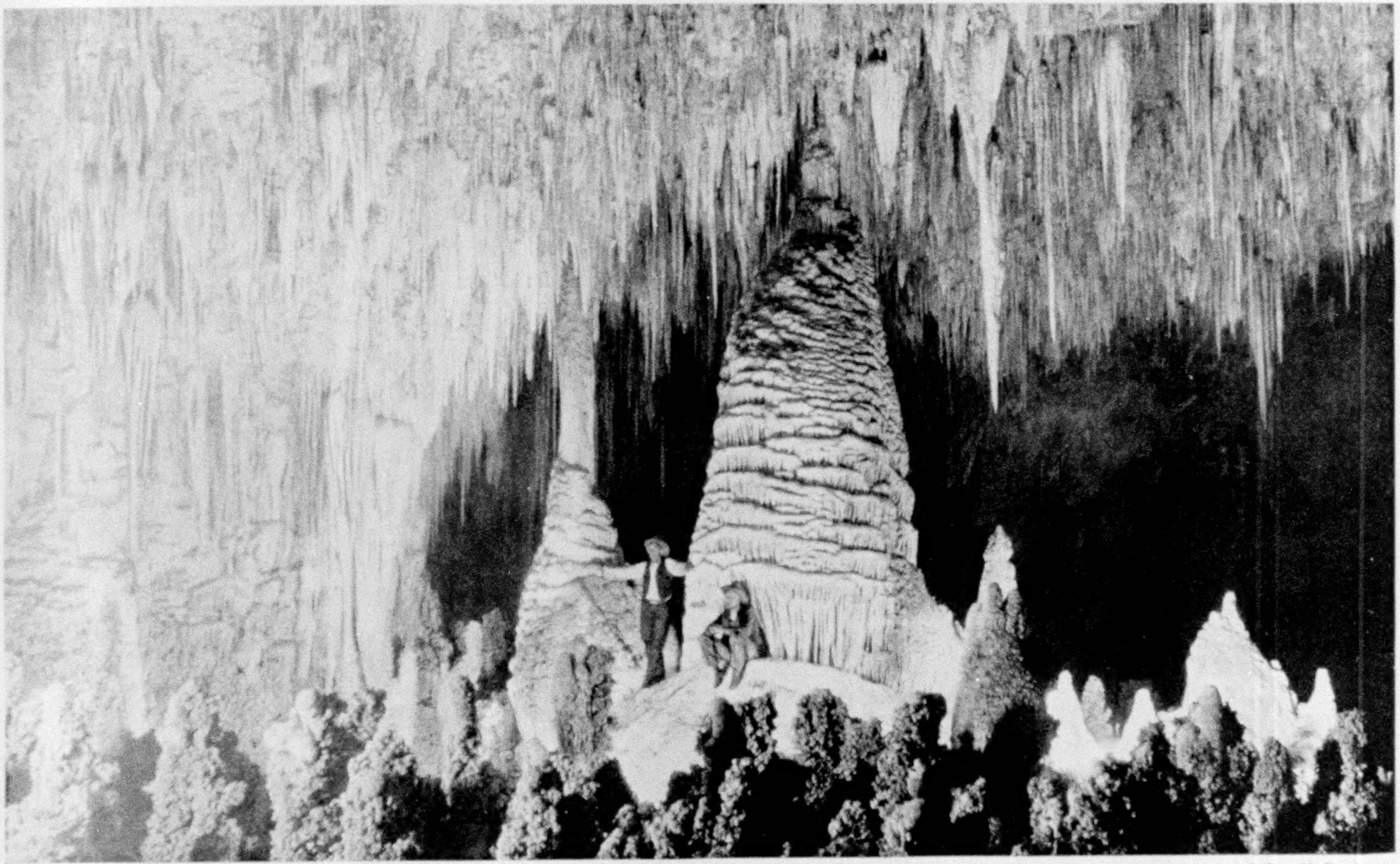
at ease until darkness again calls it forth.

But the guide has started his engine and the elevator is ready for operation. This elevator consists of a steel bucket at the end of a wire rope which passes over a pulley at the top of a derrick and is lowered through an artificial opening, or shaft, constructed for hoisting guano from the cave. The bucket holds two people if they are not too large, and if they stand very close together and hold very tightly to the wire rope.

The signal is given, the trapdoor at the top of the shaft opens, and we find ourselves dangling at the end of a line which seems like a mere thread over a black hole 170 feet deep.

Slowly we descend into the Stygian darkness, with only that threadlike rope between the world we know and love and that black, unknown inferno. The guide who operates the engine tries to be comfortingly reassuring. "The engine does not fail very often! But if it does, I can apply the friction brake before you *drop*

XUM



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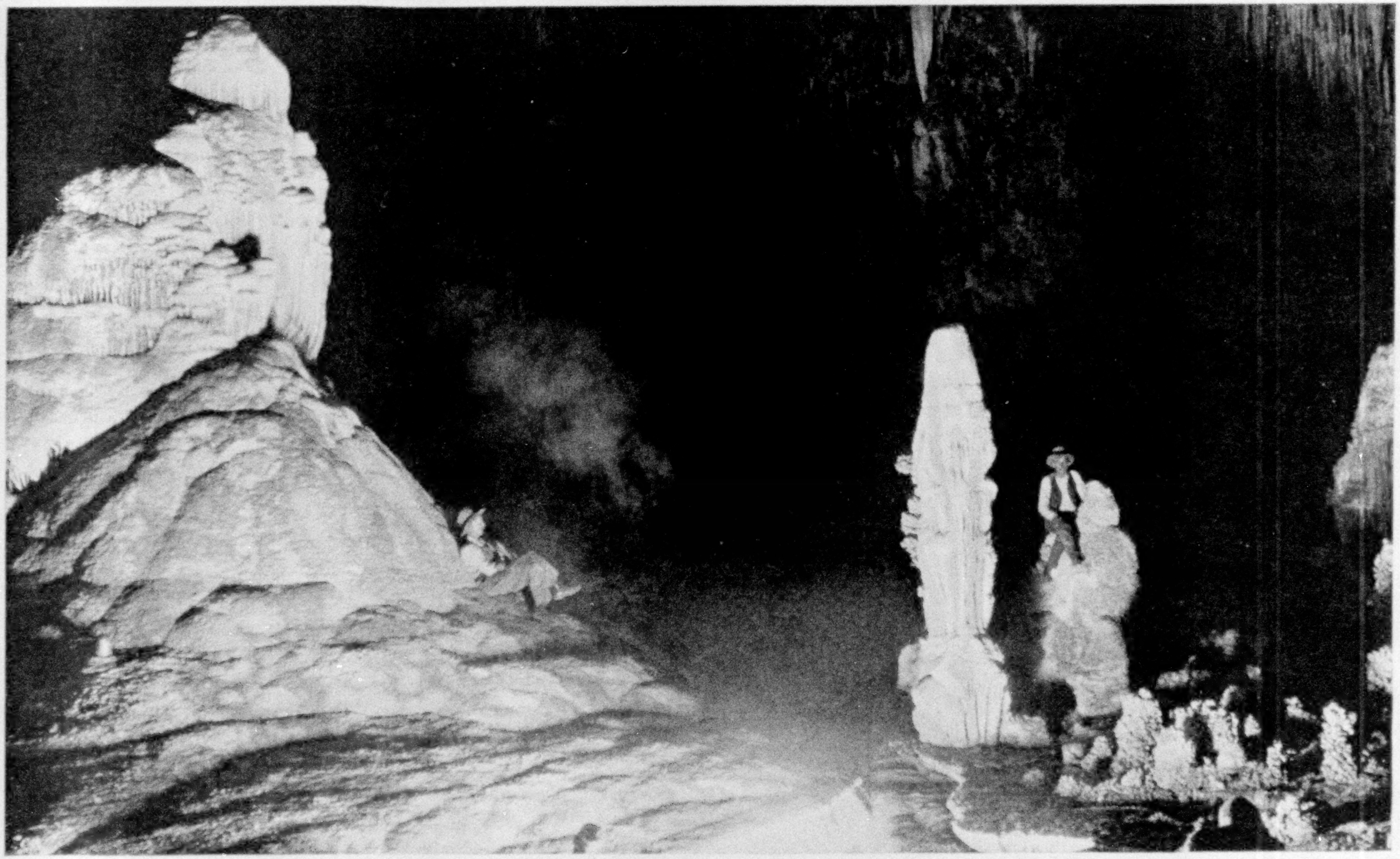
HATIN'S DOME AND THE TEMPLE OF SUN

According to Navajo mythology, Hatin and Estsan made the sky and undertook to decorate it with bits of pearl and abalone shell which the messenger Wind carried aloft for them. The constellations had been completed when Coyote, the Son of Darkness, interfered and scattered the star material over the sky in disorderly manner. Beneath the dome is the shrine of the sun god before which range the numerous coraline stalagmites (see also pages 8 and 9).



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THE GUIDE RESTING AGAINST A GIANT FLOWSTONE BEEHIVE

The floor of Shinav's Wigwam was built up during the ages by blocks fallen from the roof which have been cemented together with lime carbonate. The rooms are built one above the other for no-one-knows how many stories.

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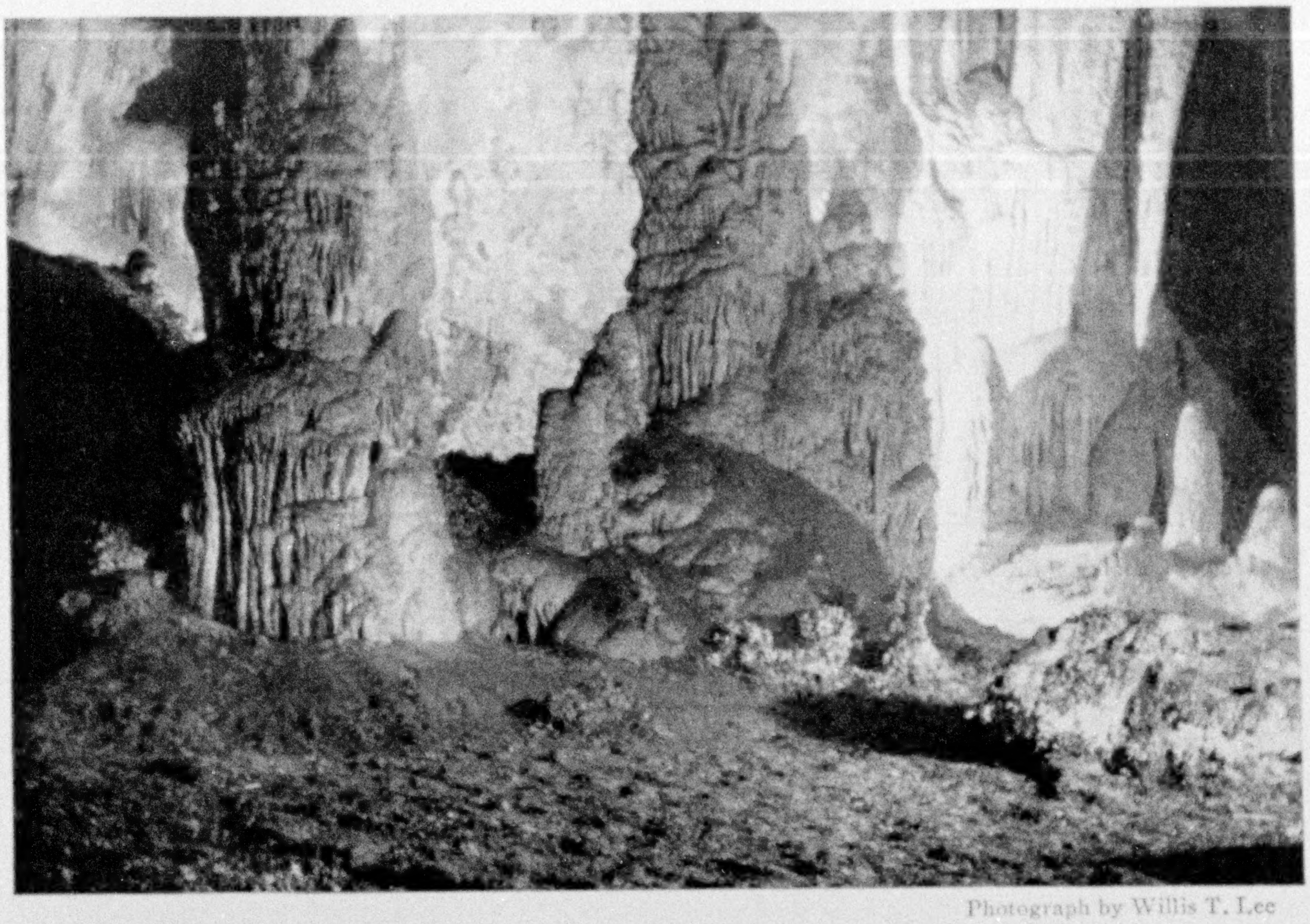
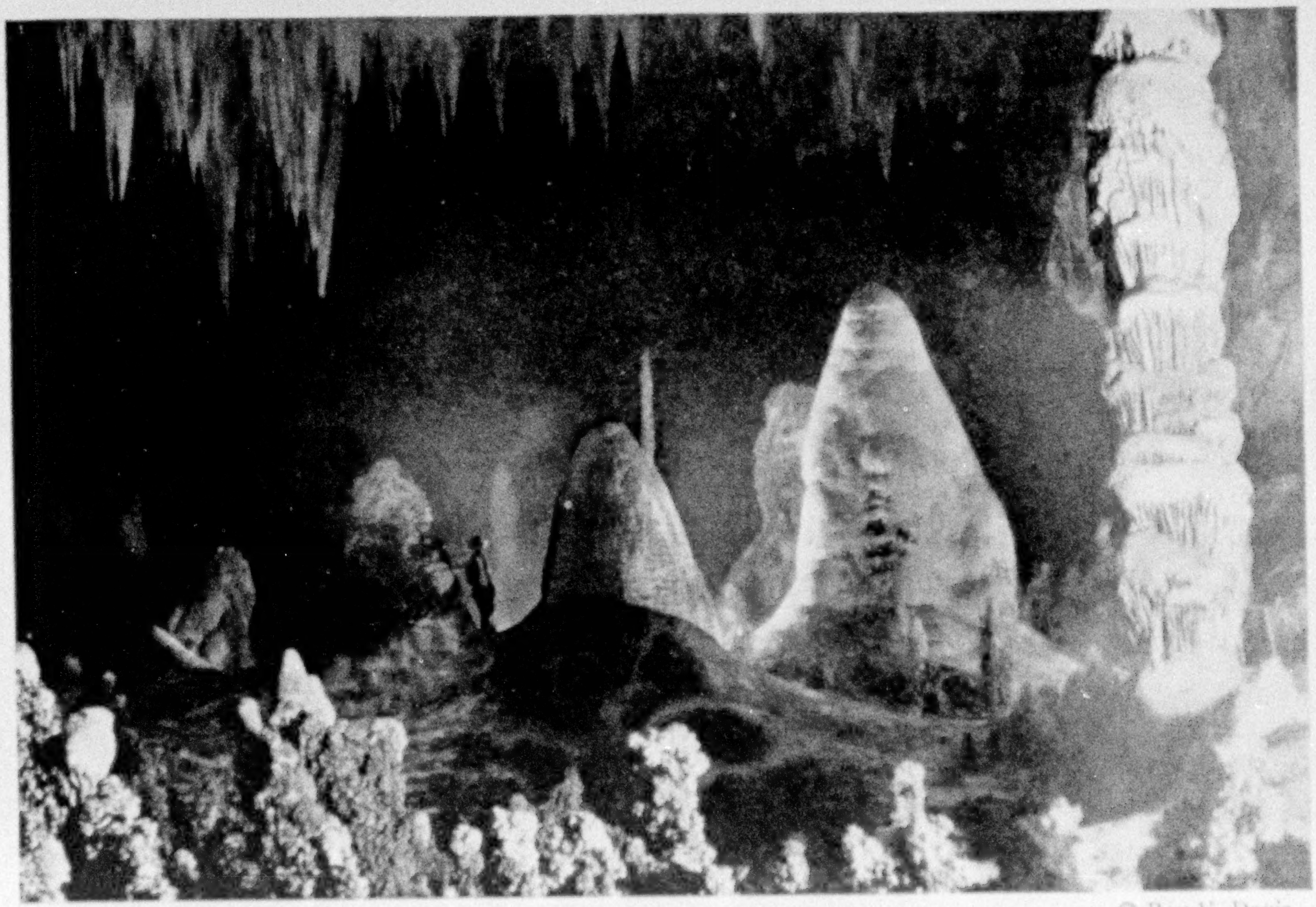


Photograph by Willis T. Lee

A PHANTOM BEAST IN THE SHADOWS OF CARLSBAD CAVERN



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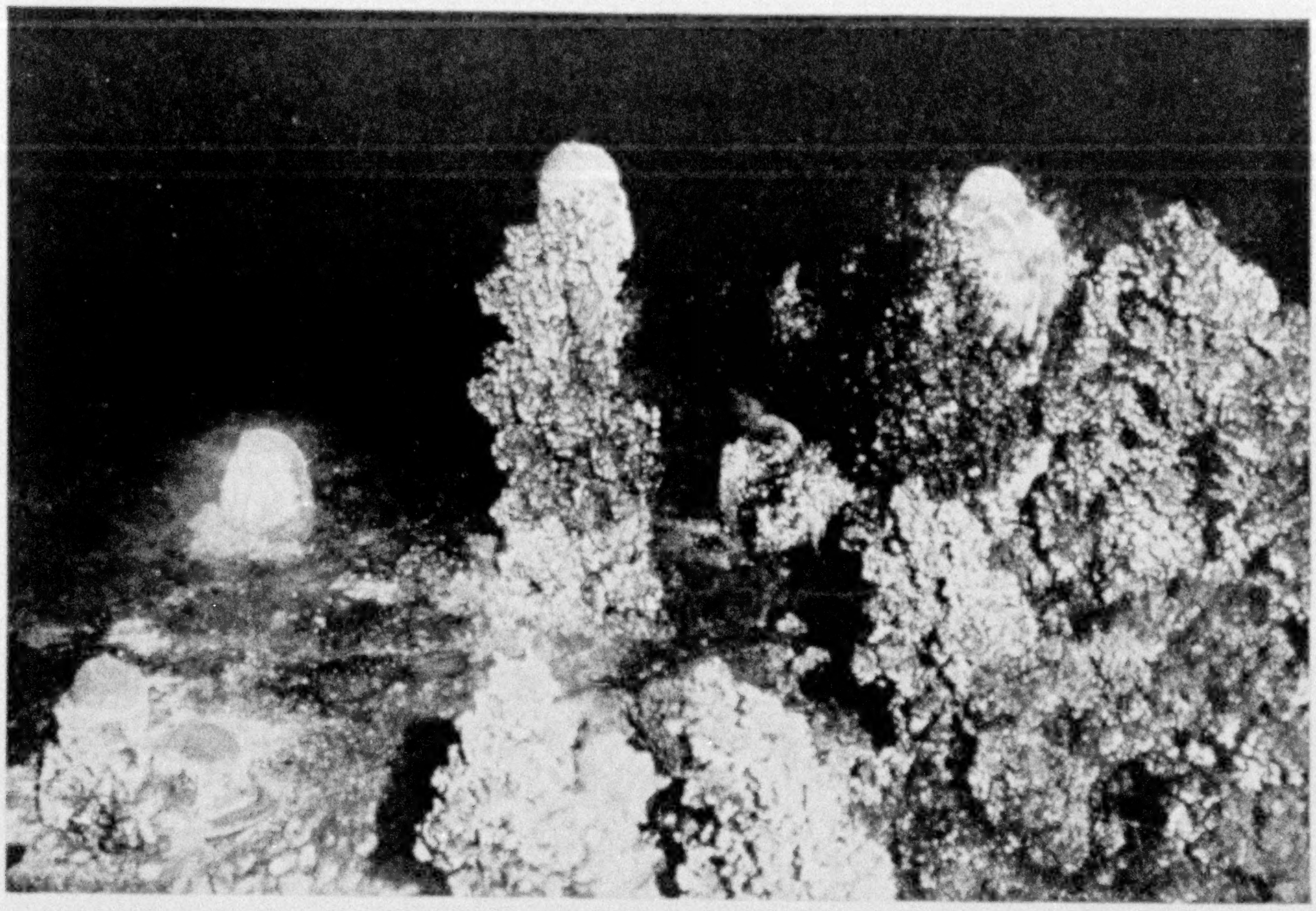
TWO TYPES OF STALAGMITES

The massive flowstone stalagmites are smooth, while the smaller ones have a rough, coralline surface. The latter suggest a group of fur-clad aborigines worshiping at a shrine (see also page 6).



Photograph by Willis T. Lee

WHERE TINY DROPS OF WATER CARICATURE MAN

The corallike formations capped by smooth dripstones resemble bareheaded men in ragged clothing. A small figure on the floor to the left is shaped like a soldier's helmet. Some of these stalagmites are "drinking fountains," with splashcups at the top, which catch water dripping from above. Others are "frozen" fountains, in which the splashcup is filled with clear onyx, resembling ice (see text, page 30).

*very far!* In any case, there is soft material at the bottom of the shaft!"

It occurs to me, as we descend with starts and jerks, to wonder whether certain vivid descriptions in *Divina Commedia* were written after Dante had been lowered into a bat cave in a guano bucket.

### IN VAST, DARK UNDERGROUND SPACES

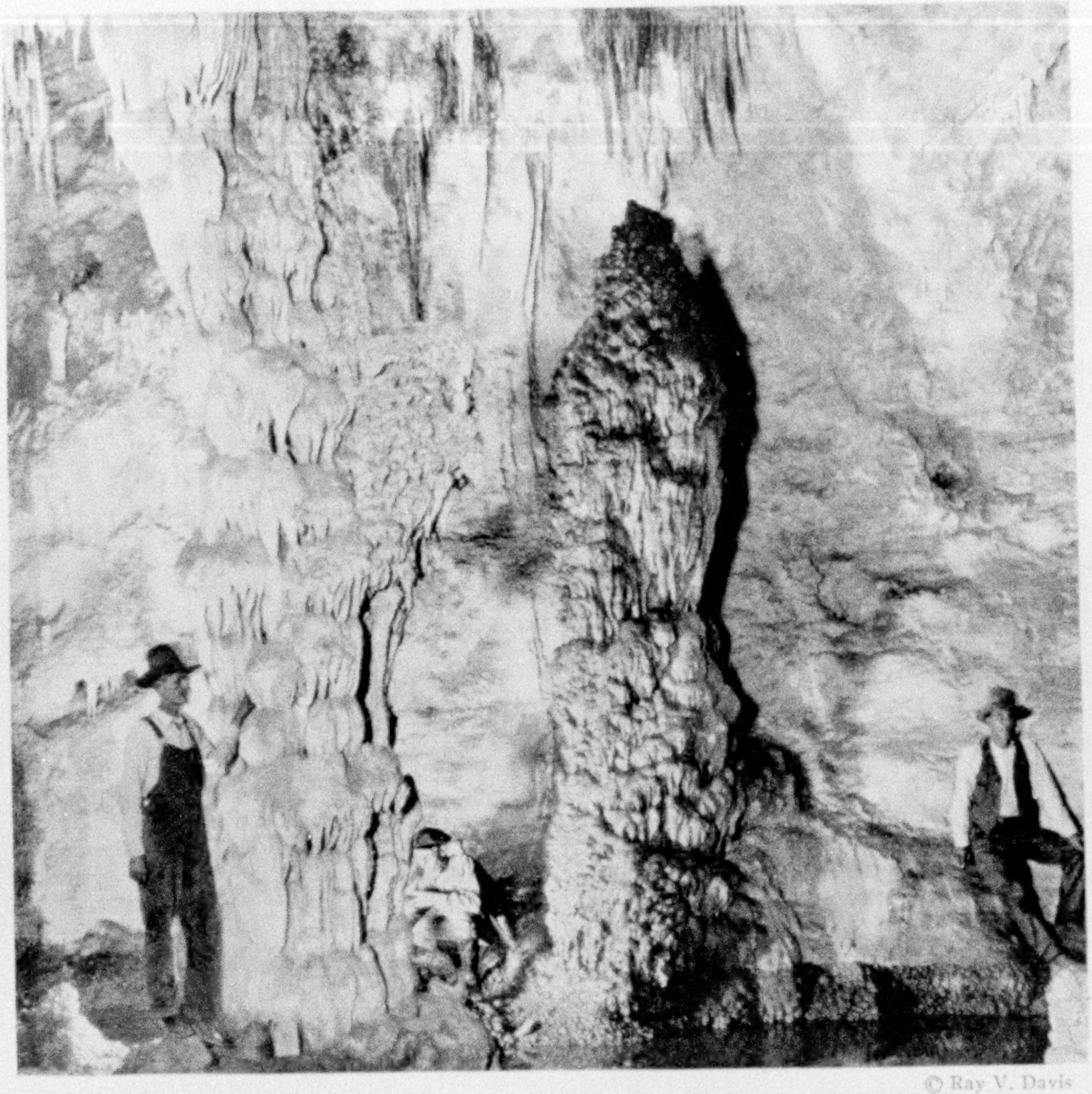
On reaching the bottom we devote some time to getting our "cave eyes" and to preparing the torches which are to furnish light on our subterranean journey.

Gradually, as we become accustomed to the gloom, the enormity of the underground cavity which we have invaded is borne in upon us. The opening of the shaft above us is a mere speck of light. Weird, shadowy forms seem to approach out of the darkness, as our eyes gradually adjust themselves to the dim light. Finally the rugged sides of the cavern take form and we find ourselves in a passageway of unusual width, with arched roof so far above us that our torches only dimly illumine it.

The bats are found chiefly in the part of the cave east of the shaft. The scenic portions, toward which we now make our way, lie in the opposite direction.

For some distance the route is not difficult, but the pathway is rough, for the lower part of the cave is filled with angular blocks of rock fallen from the walls and ceiling. The thickness of this débris is not known, but in some places, where the blocks are large and the spaces between them open, men are said to have made their way downward 200 or 300 feet below the present floor.

Perhaps a statement in the interest of caution may be in place at this point. Very little accurate information relative to this cave is available. Few measurements have been made, and it is a well-recognized fact that, in dimly lighted caverns, imagination runs ahead of the tapeline. The guide is the only source of such



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YEITSO'S PILLAR, AN ONYX COLUMN NEAR THE ENTRANCE TO THE CAVERN

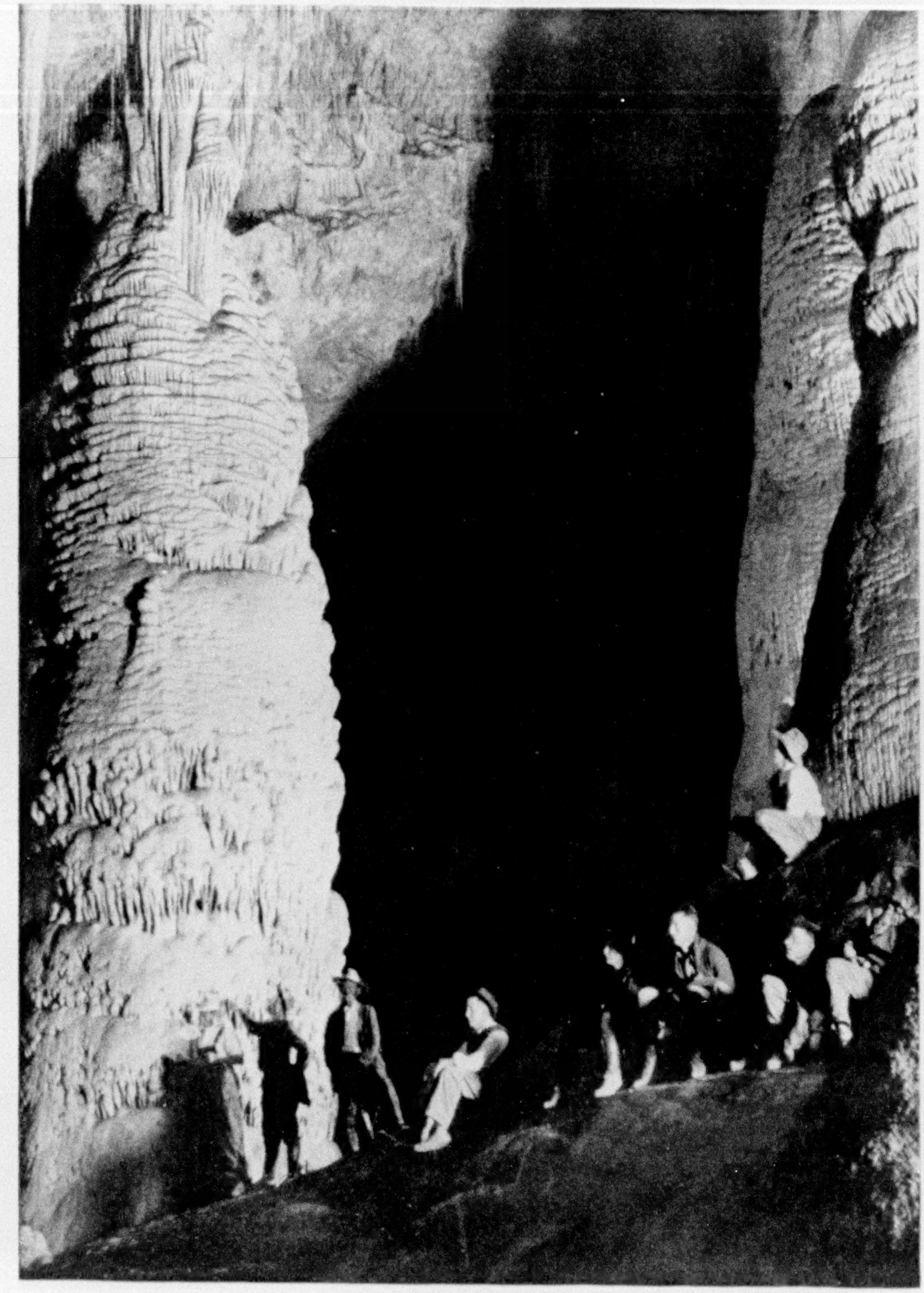
The water from the ceiling deposits its load of dissolved lime carbonate on its way downward, building tiny overflow fountains on the sides of the stalagmites, and finds its way at last into the large fountain shown in the foreground at the right, where the residuum of carbonate forms the embossed rim of the basin.

meager information as may be obtained. Far be it from me to cast aspersion on an estimable guide whose business it is to entertain his guests. Like other guides before him, he has discovered that tourists appreciate hair-raising yarns more than hair-splitting distinctions. According to his own statement, our guide does not allow dull fact to interfere with a good story.

Possibly there will in time appear here a sequel to the volume entitled "Truthful Lies," which will embody the strange characteristics of the Southwest, as that unique volume does those of Yellowstone Park. When such a volume is published I want to secure the first copy. However, in the present story I am using only such statements as seem reasonably justified by my own observation.

### A CORRIDOR AS LONG AS THE INAUGURAL PARADE ROUTE

About half a mile from the foot of the shaft, we enter the part of the cave reserved as a national monument and soon pass beneath the natural opening. This opening, far above us, which seems so awesome at the surface, appears from the floor of the spacious cavern like a small



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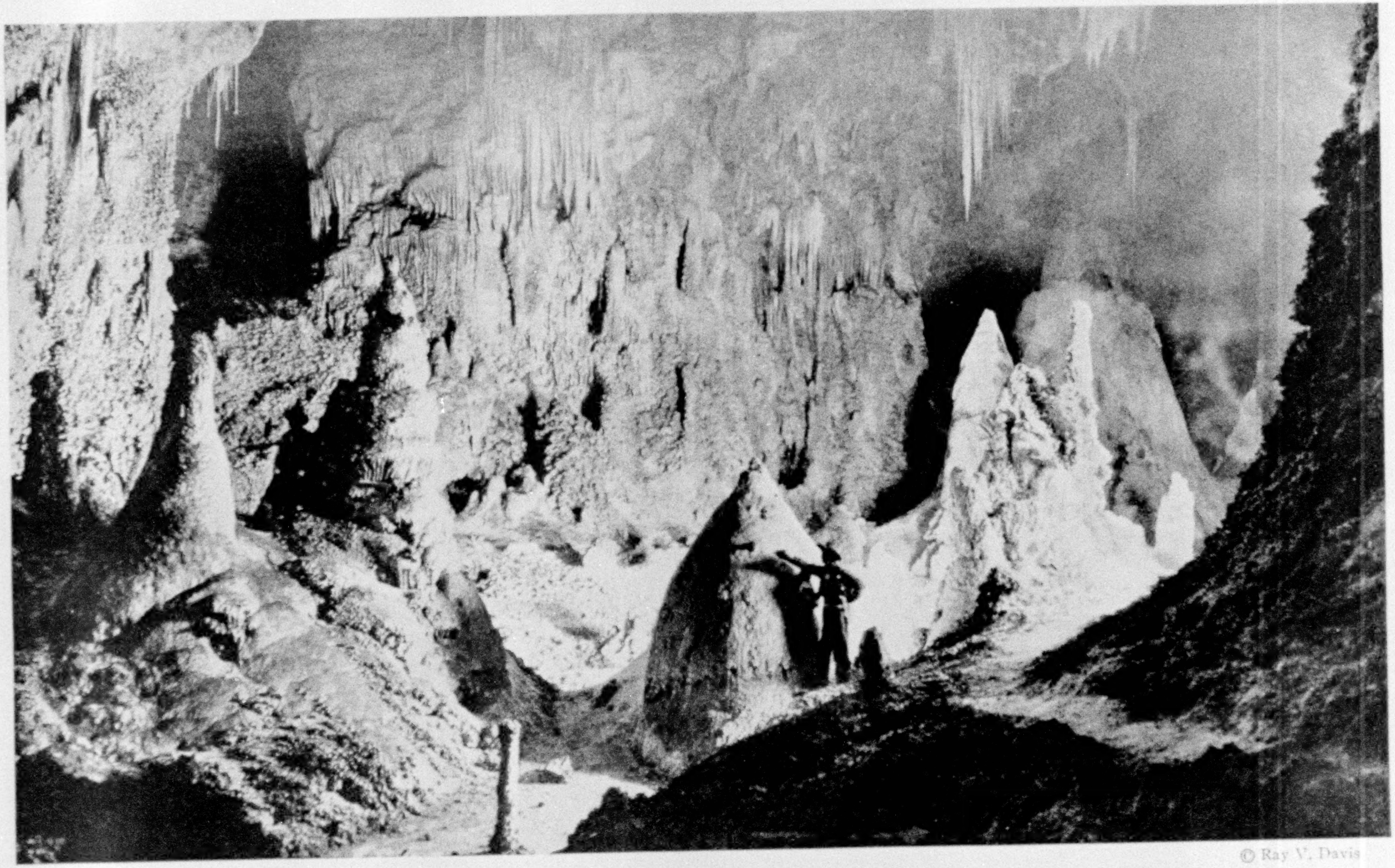
GIANT COLUMNS OF A STYGIAN TEMPLE

The massive pillars rise from a broad base of dark, smooth flowstone of unknown dimensions. Only the lower portions show in the picture, and their great height may be judged by comparison with the human figures.



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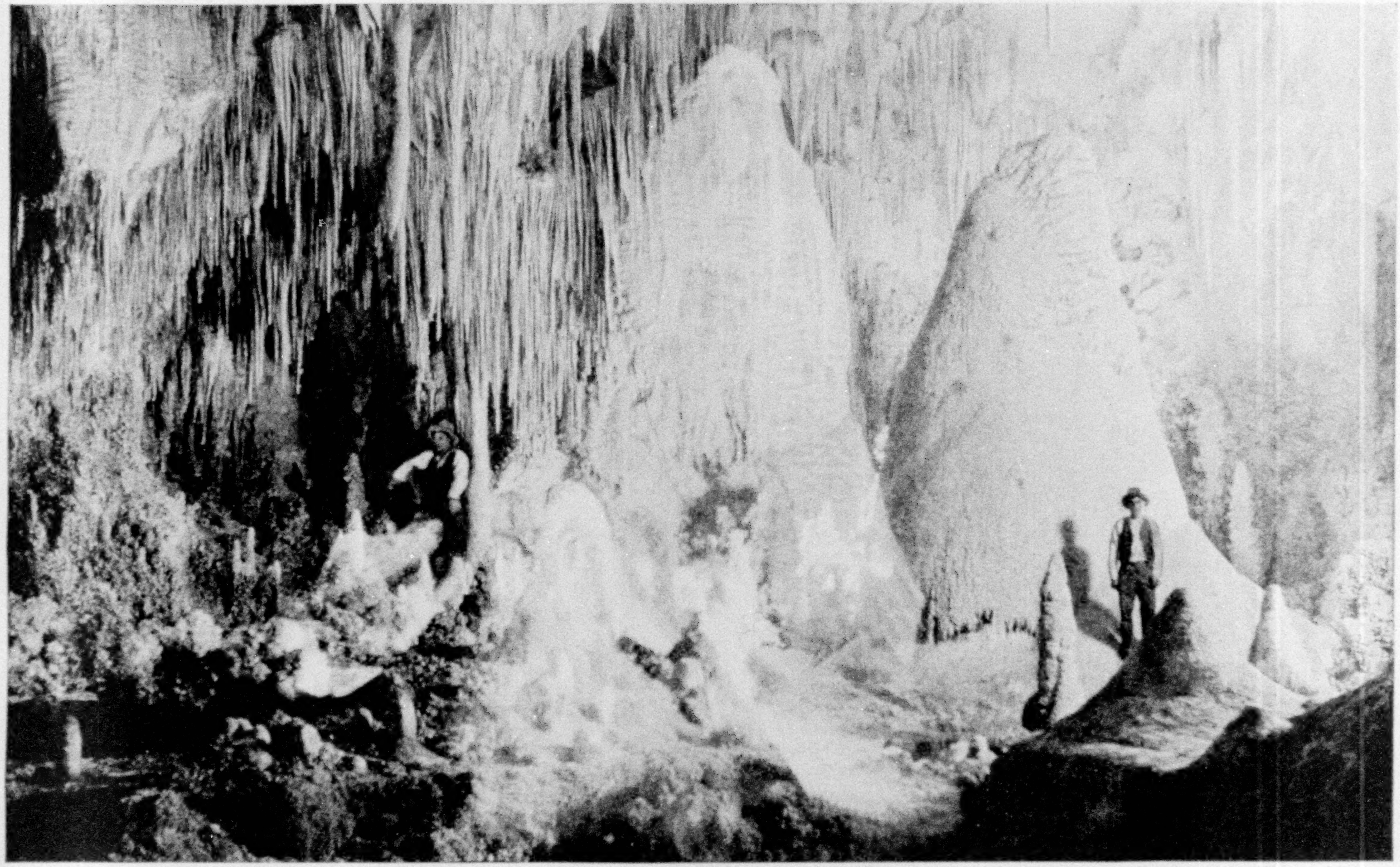
DOH'S KIVA IN THE HALF-MILE-LONG BIG ROOM

According to Apache mythology, Doh, the fly, built a kiva for the sun, and in it were formed three deities. To be noted are the slender drinking fountain in the foreground, the large and smooth stalagmites of flowstone, the frostwork decoration of the walls, and numerous pendants of dripstone.



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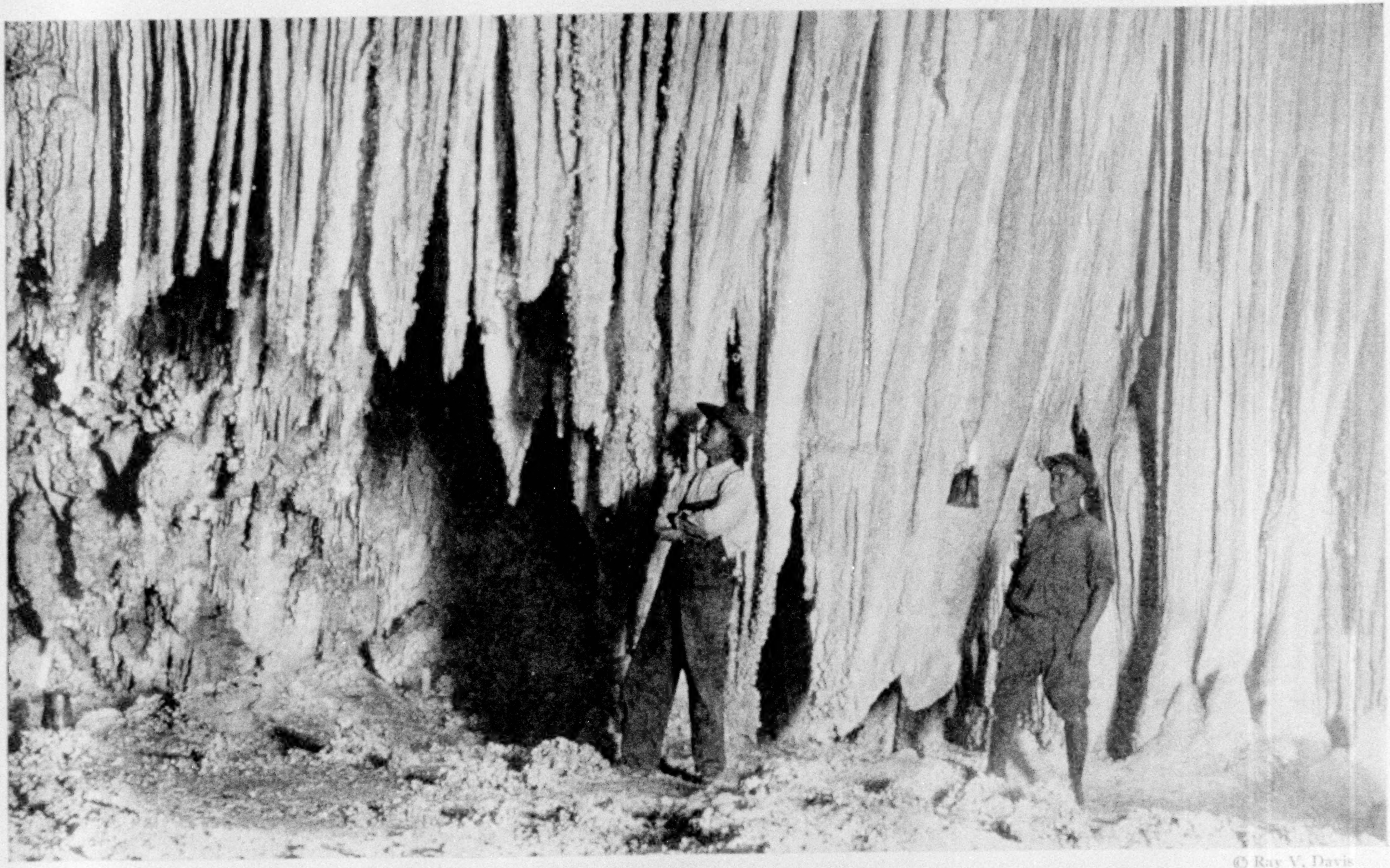
THE AZTEC'S SHRINE

For untold ages these monuments of onyx have stood in total darkness. Once, and only once, has their glory been made visible. Like some character in history, made prominent for a moment by some flash of circumstance, these forms stood forth proudly for an instant in the magnesium light which fixed the image on the photographic plate, and then returned to obscurity.

XUM



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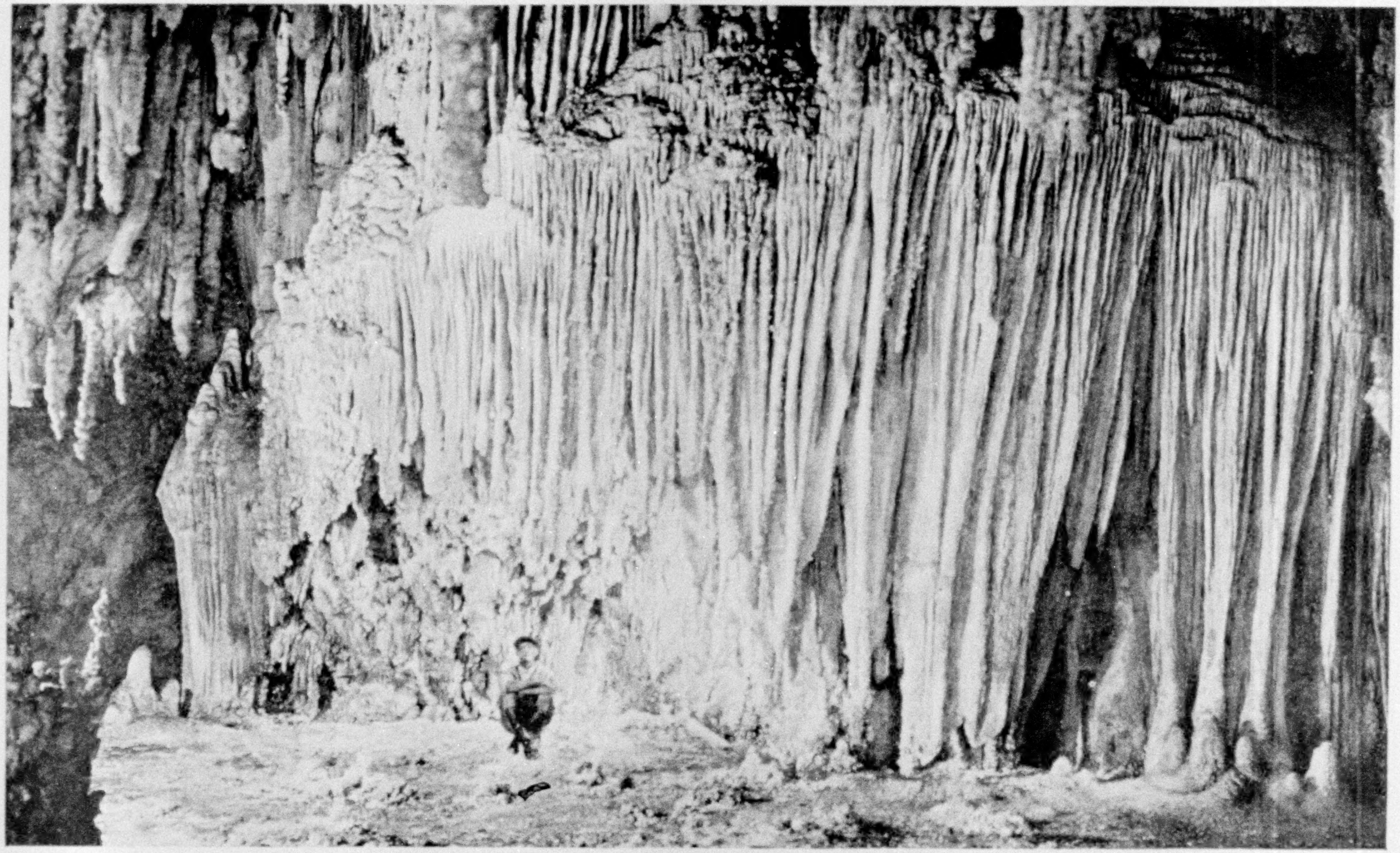
SHINAV'S ROBE IN SHINAV'S WIGWAM

This is one of the curtainlike walls of the large room called Shinav's Wigwam, which has been formed by stalactites growing laterally until they coalesced into a great sheet or wall.



Photograph by Willis T. Lee

A NAVAJO BLANKET WALL IN SHINAV'S WIGWAM

To the right a parting of the drapery invites the visitor to an anteroom. To the left is a passageway to an adjoining chamber.

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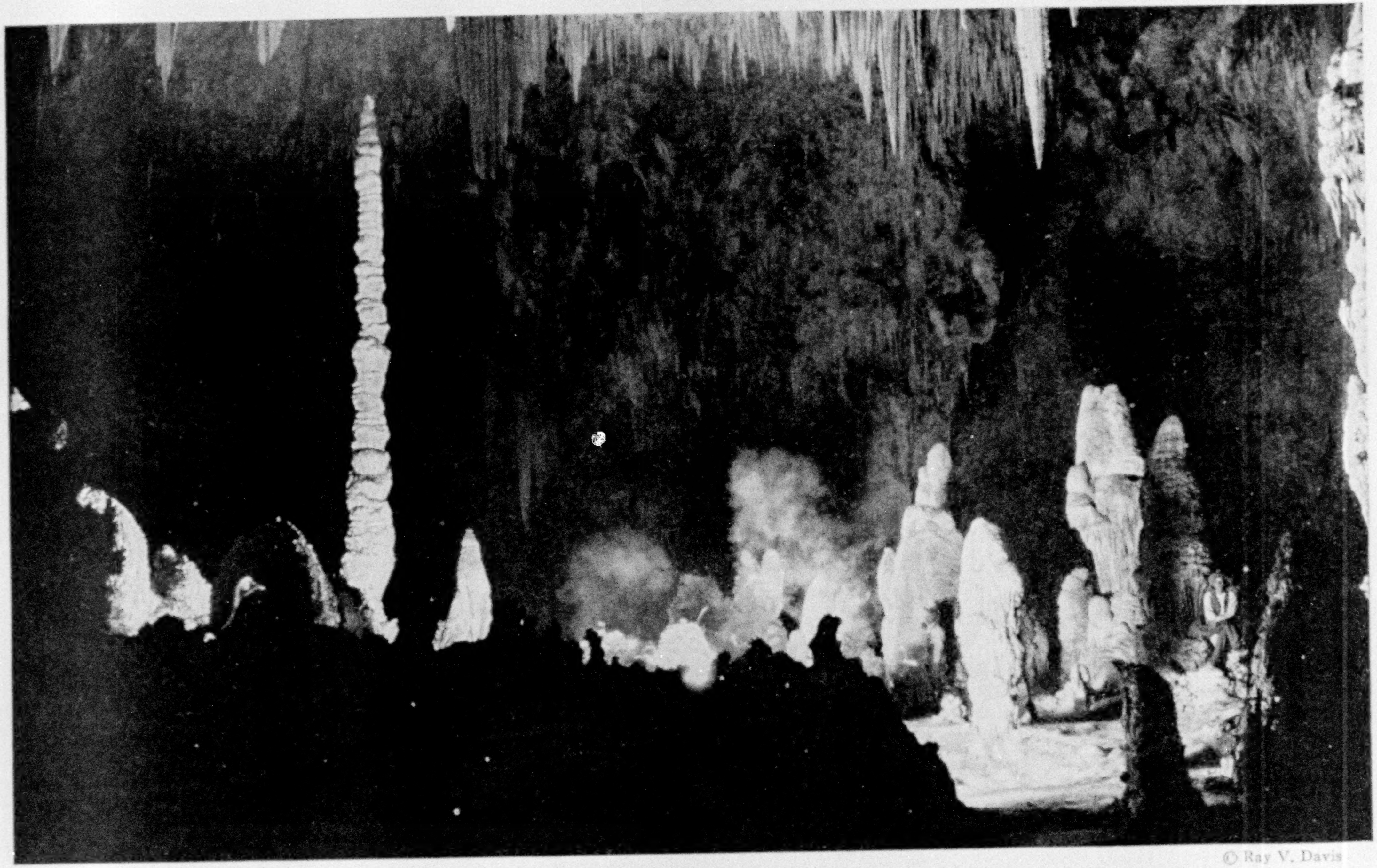

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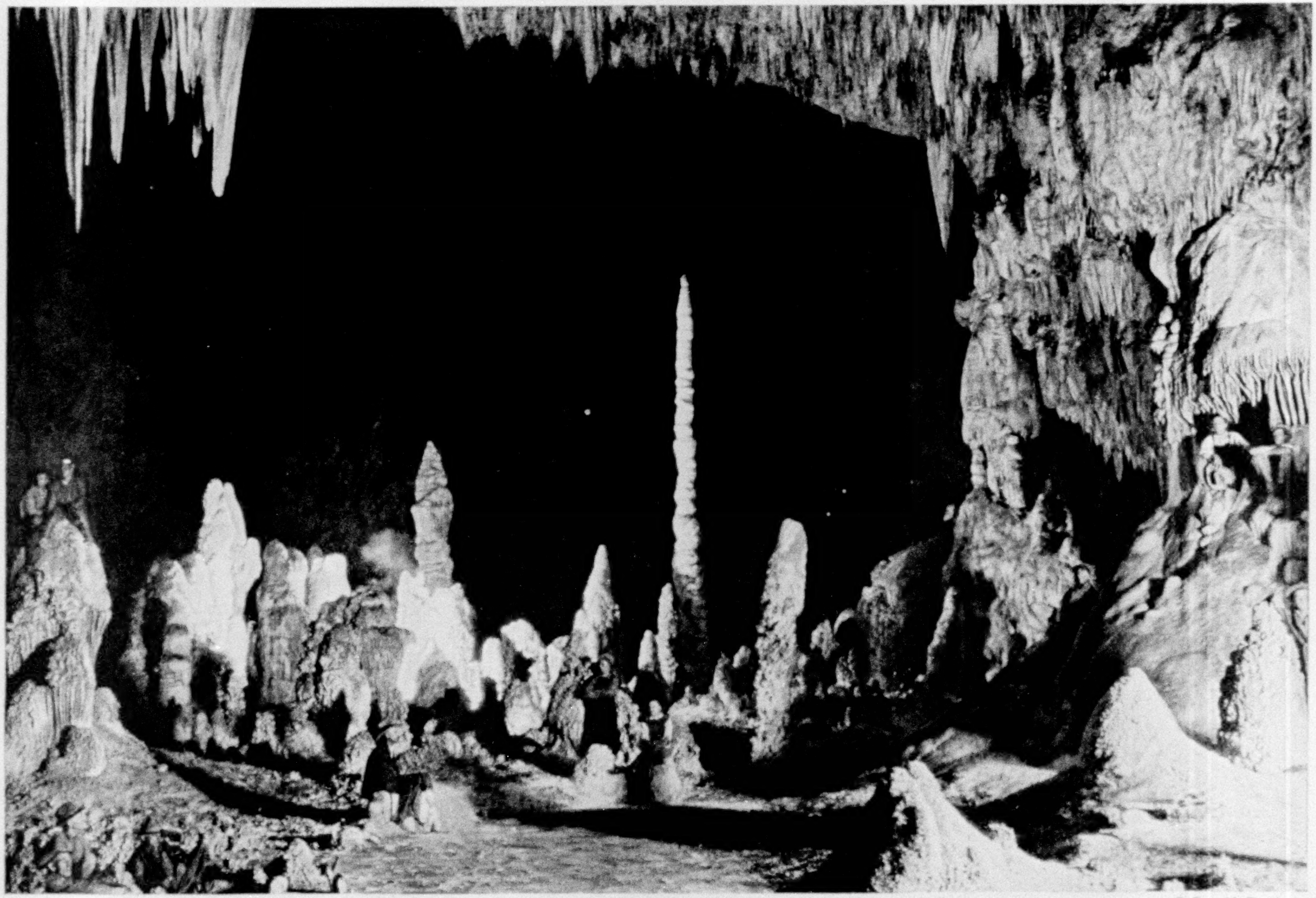
A GROUP OF SLENDER, GRACEFUL STALAGMITES RESEMBLING TOTEM POLES IN THE BIG ROOM

Nature has here paid appropriate tribute to the Indian tribes which once ranged over the surface land of Carlsbad Cavern's area.



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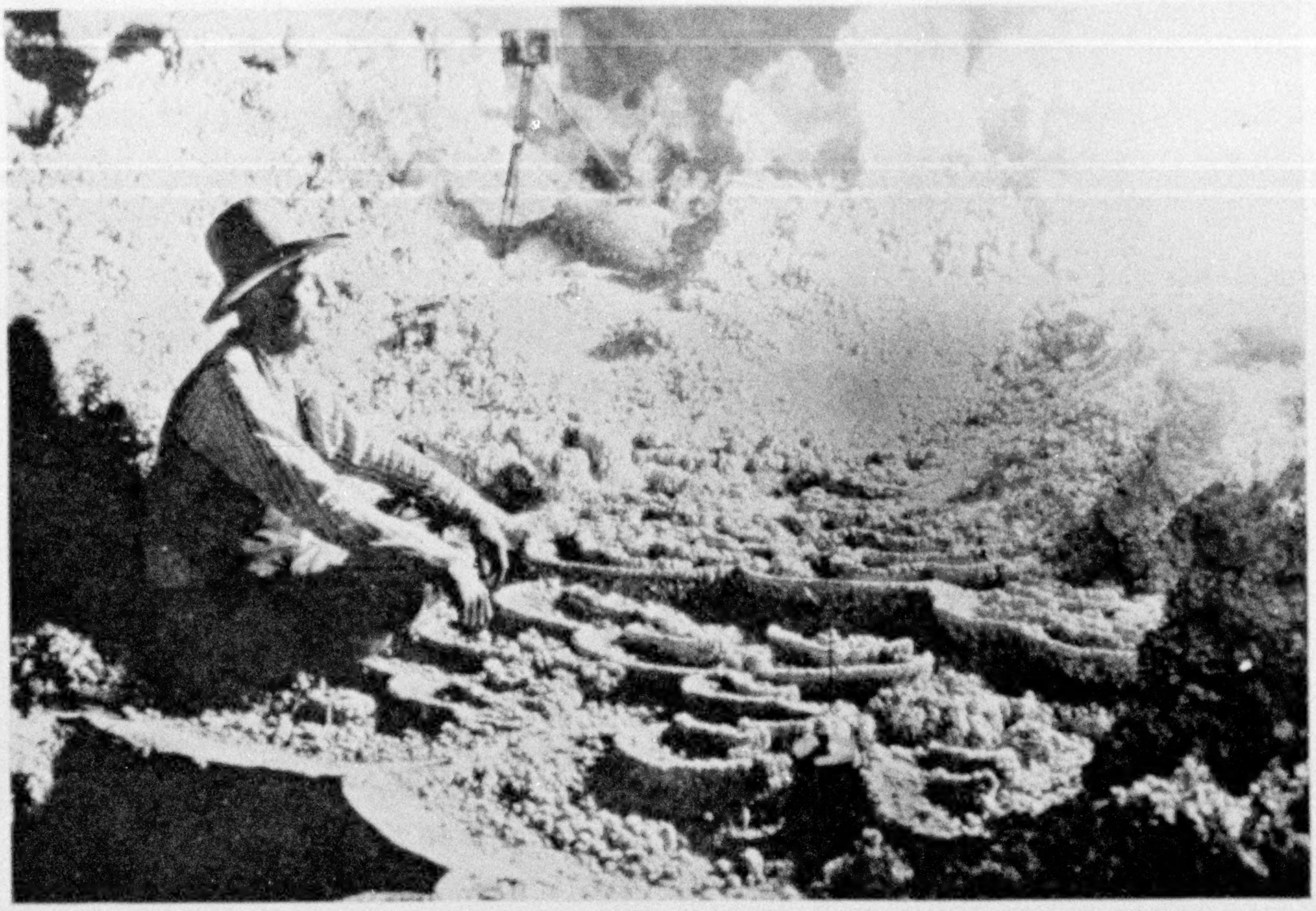
ANOTHER VIEW OF THE GROUP OF STALAGMITES KNOWN AS THE TOTEM POLES (SEE ALSO ILLUSTRATION ON OPPOSITE PAGE)

Note the exquisite formation resembling a fringed shawl, on the extreme right.



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A GROUP OF "LILY PADS" IN THE BIG ROOM

Basins such as this, some of them 10 feet deep and 50 feet in diameter, represent the same formation as the still-flowing Biscuit Spring of Yellowstone National Park (see text, page 30).

and very inconspicuous aperture. Here we give it scarcely a second thought and pass on to the more impressive features which appear at each turn.

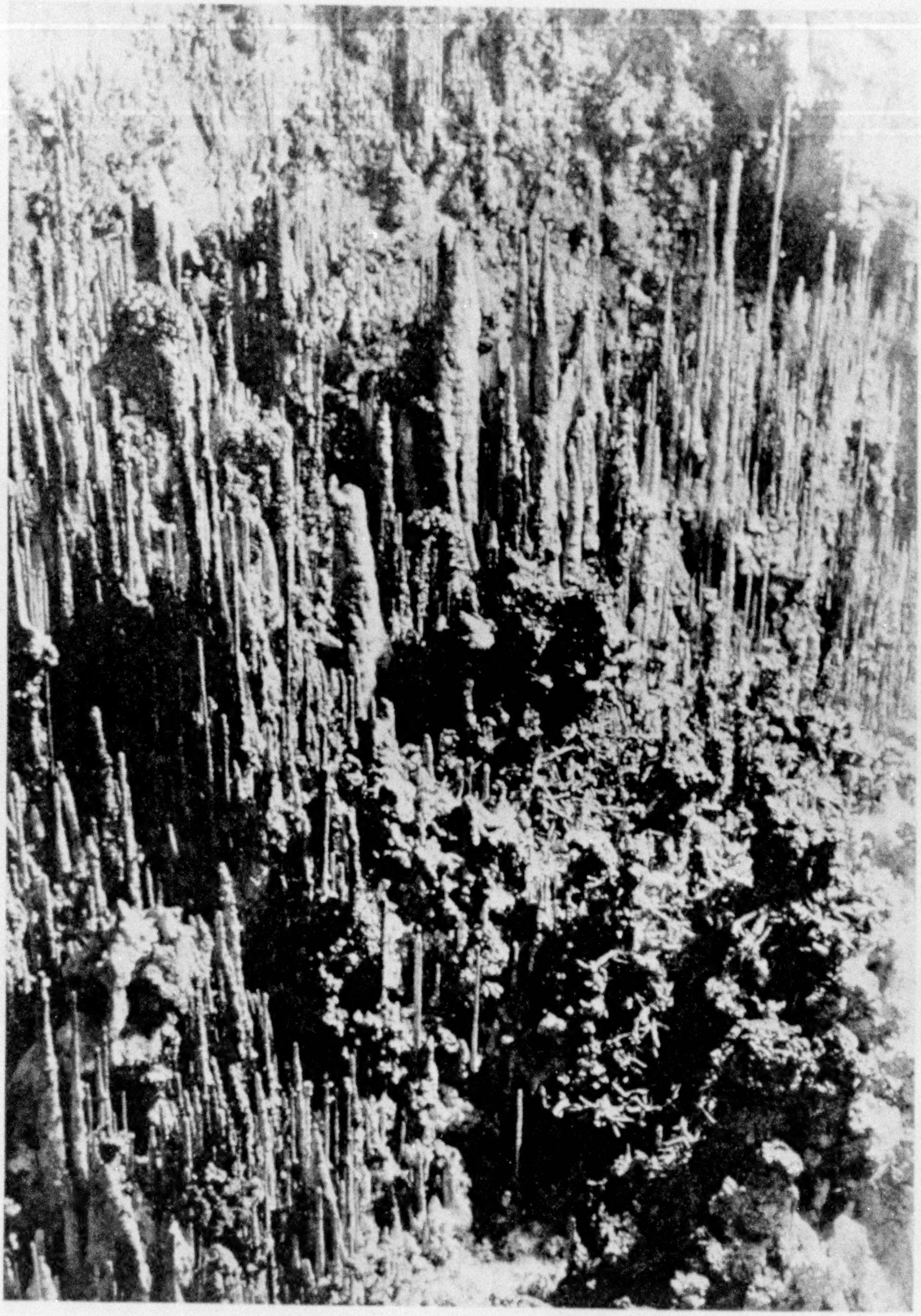
As we proceed we gradually make our way deeper and deeper into the earth. For nearly a mile, or a distance almost equivalent to that between the White House along Pennsylvania Avenue to the Capitol, in Washington, we traverse a passage of astonishing dimensions. The walls are very irregular, approaching to within 100 feet of each other in a few places, then receding in lateral chambers many times that width. At the side of the passageway are many alcoves opening into rooms, few of which have ever been entered and not any of which have ever been described.

In most places the walls are rough and jagged, where masses of rock, now lying on the floor, have fallen. But in a few places the walls are relatively smooth, having been polished by waters which flowed through this passageway ages ago.

There is relatively little dripstone in this part of the cave. And yet every now and again, as a beam of light is directed into the darkness, one is startled at the sight of a snow-white figure perched on some rock, like the proverbial ghost on a tombstone. These are stalagmites built up by the slow dripping of water charged with carbonate of calcium from the limestone of the roof. A few of these stalagmites like Yeitso's Pillar (see illustration on page 10) have been built up into magnificent fluted and ornately decorated columns, as if supporting the ceiling of a vaulted cathedral of vast dimensions.

In a few places the deposits of carbonate of lime have accumulated against the side walls, where water trickles from the rock. The lime carbonate, released from solution on entering the open cave, has accumulated in masses which resemble ice that forms on a cold winter's day near a stream of flowing water. Some of these "cascades frozen in stone" are large and impressive. To distinguish this material from that deposited by dripping water, it may be called flowstone.

But these formations, both of flowstone and of dripstone, are so much more



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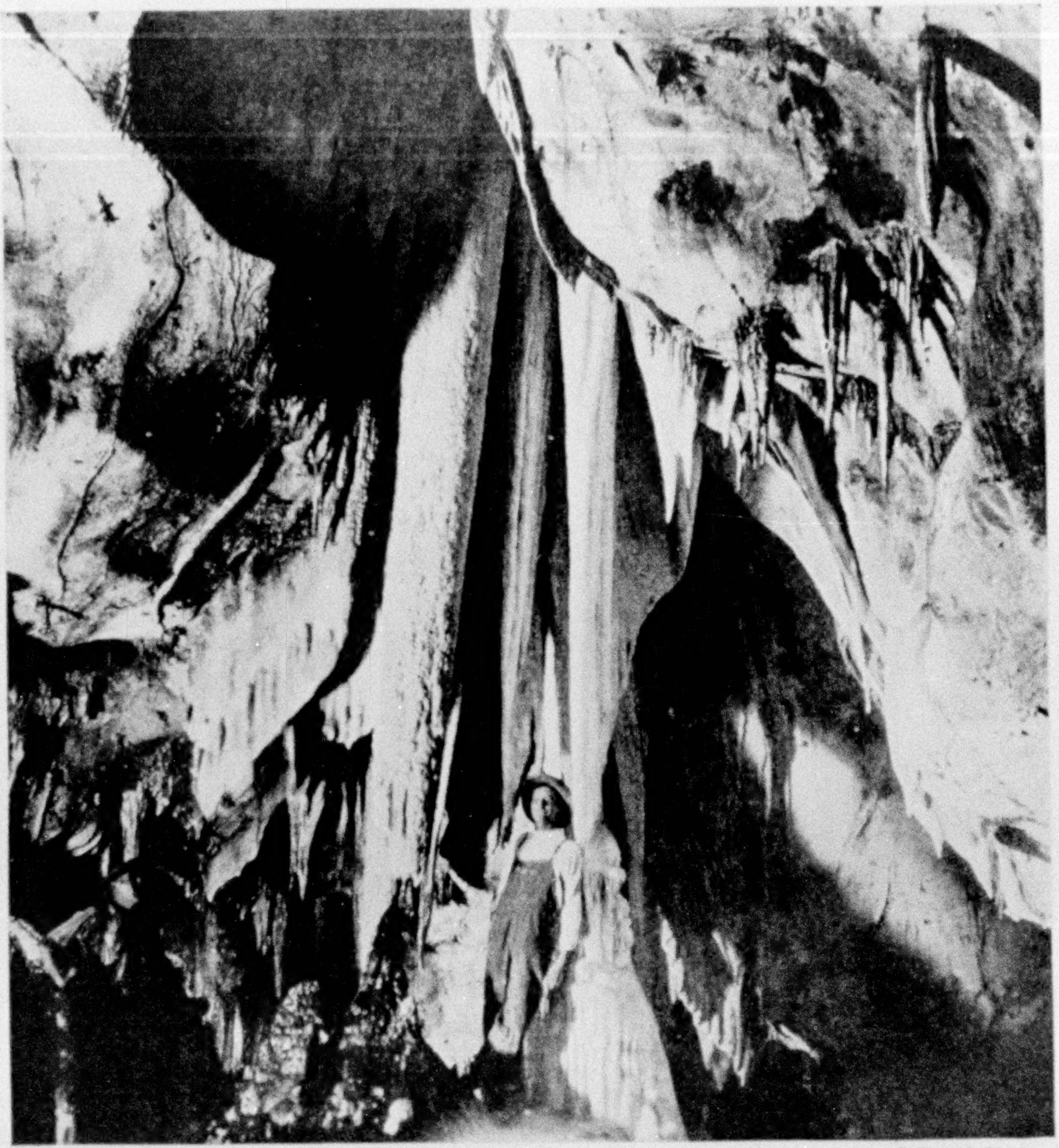
THE "CROW'S NEST" THICKET OF SLENDER STALACTITES AND STALAGMITES

This room, which is 50 feet broad, is so thickly set with these bamboolike formations that one cannot pass through it without destroying scores of them (see text, page 27).



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THE "ELEPHANT EAR" AND "PORCUPINE WALL"

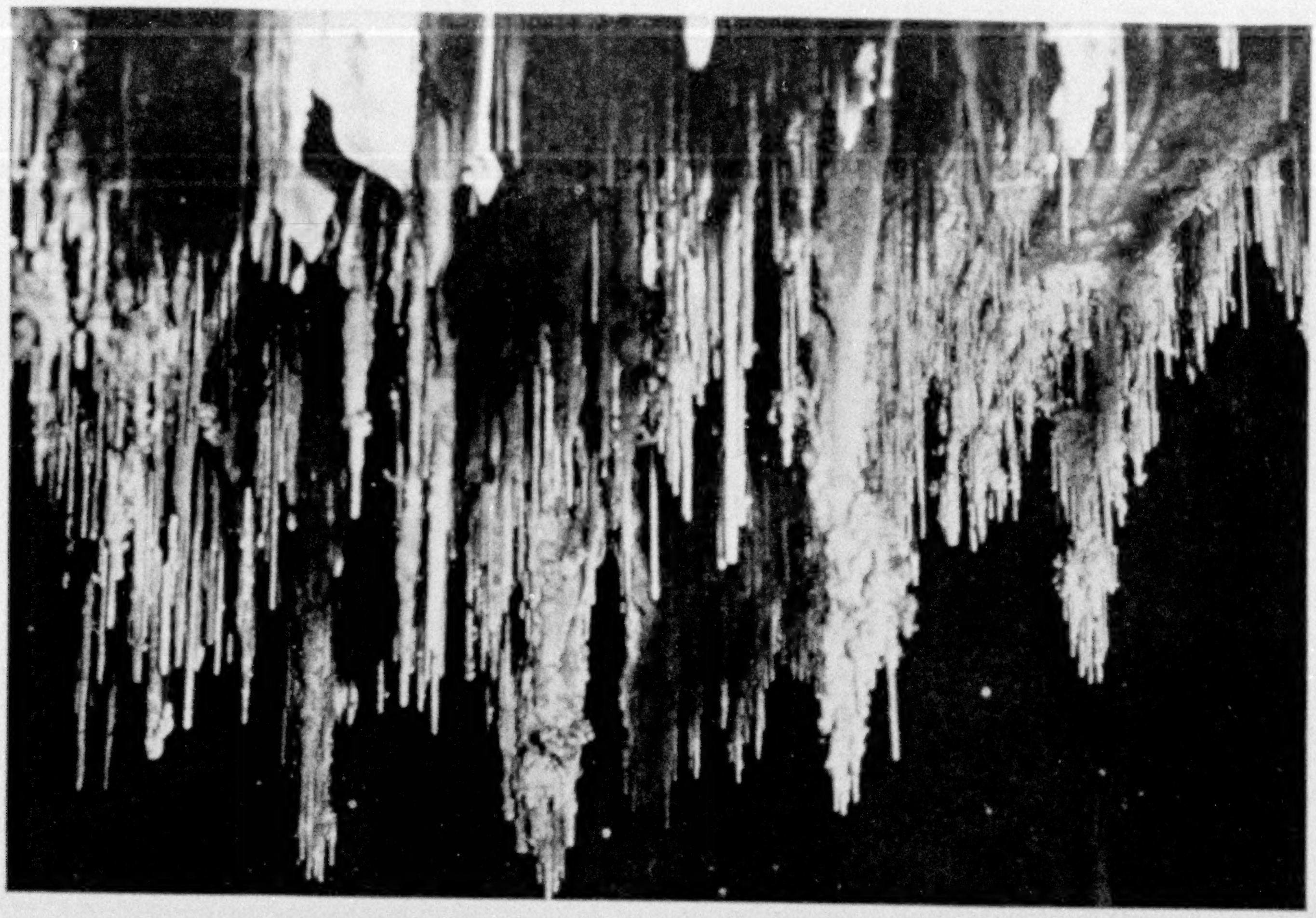
The piece which won the first nickname is the curved sheet over the figure, thinning toward the right to a knife-edge. The spikelike stalactites on the overhanging wall are unusual.

numerous, varied, and ornate farther on, that we hasten over this first part of the journey, even though, were it not for the more spectacular scenes beyond, this part of the cave would probably be regarded as worthy of extended notice.

## A PIT YAWNS IN EXPLORERS' PATH

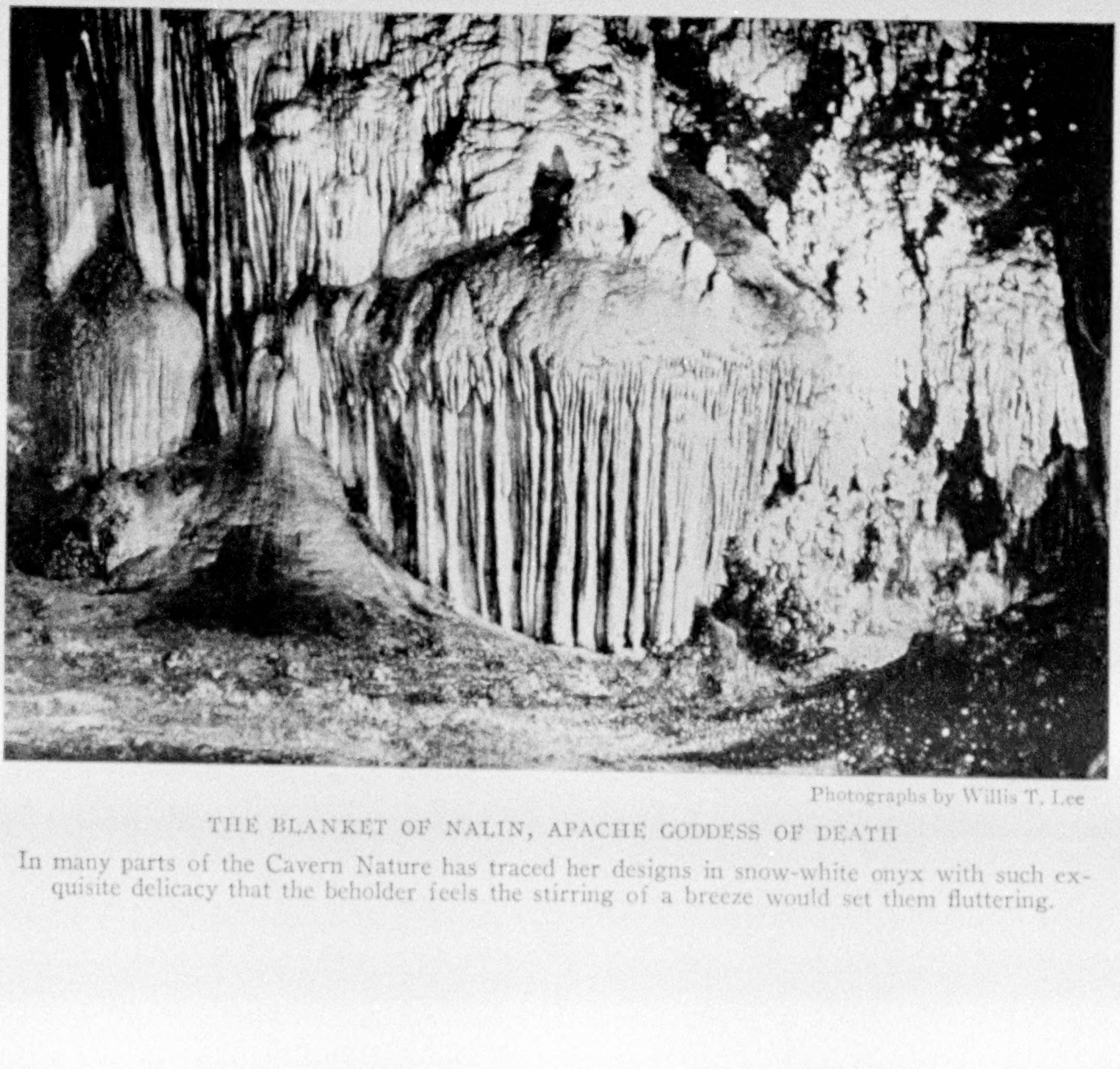
Thus far the journey has been relatively uneventful; but nearly a mile from the foot of the shaft, or a quarter of a mile from the natural opening, a real difficulty is encountered. Here the floor of the cave has not been built up as far as on either side, so that a pit something more than 150 feet deep and extending entirely across the cavern suddenly yawns in our path. This hole has been called Yeitso's Den, a name which recalls the Navajo Indians' mythical monster whose blood formed Red River (the Colorado) and congealed in some places in lava flows, when he was slain by the great god Sun.

The sides are so steep that footholds must be cut, and a wire somewhat



THE CHANDELIER OF A THOUSAND PENDANTS

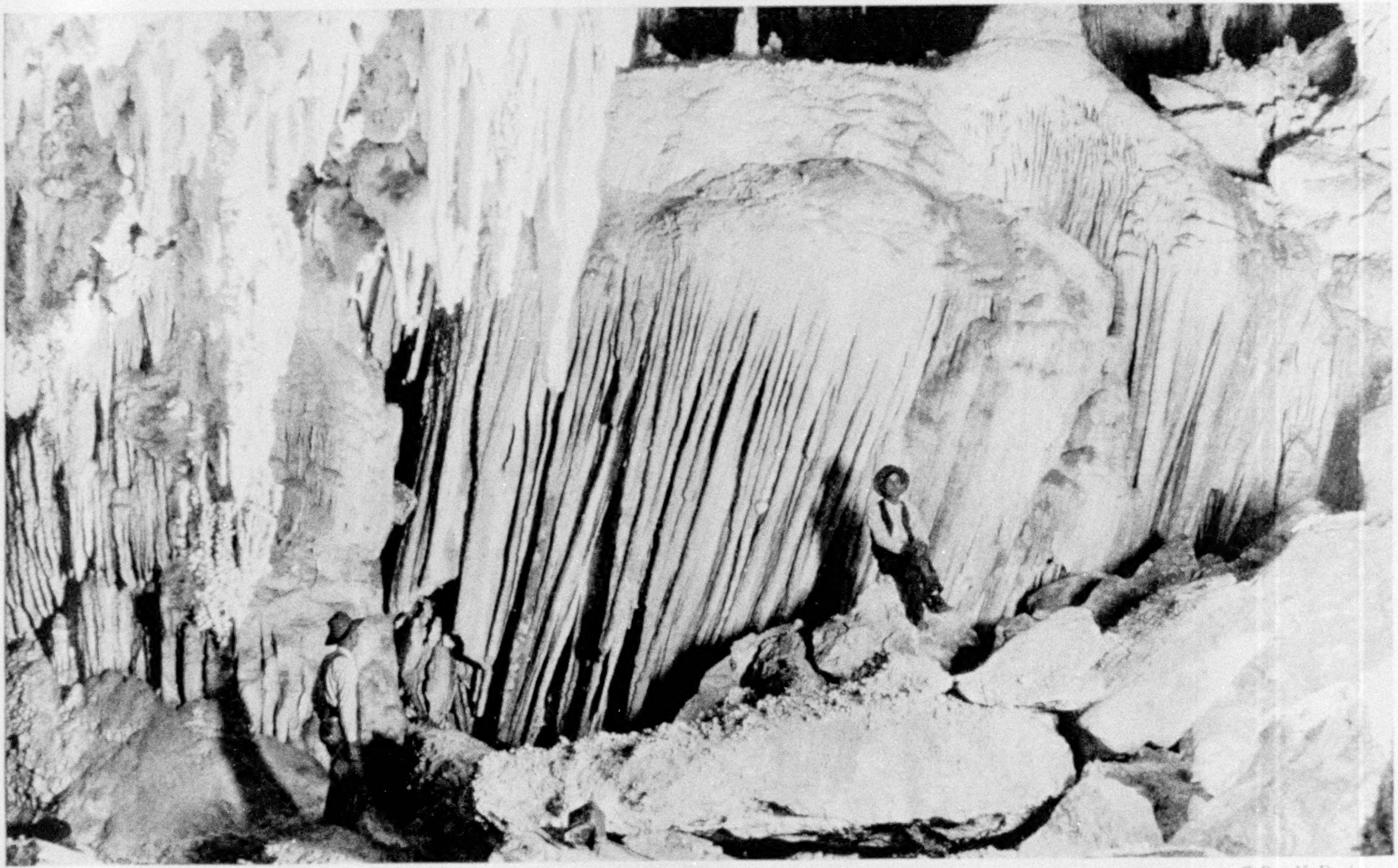
This enormous drop is notable for the numerous slender pencils and the broad, thin, curved sheet of onyx in the upper left center of the picture.



Photographs by Willis T. Lee

THE BLANKET OF NALIN, APACHE GODDESS OF DEATH

In many parts of the Cavern Nature has traced her designs in snow-white onyx with such exquisite delicacy that the beholder feels the stirring of a breeze would set them fluttering.



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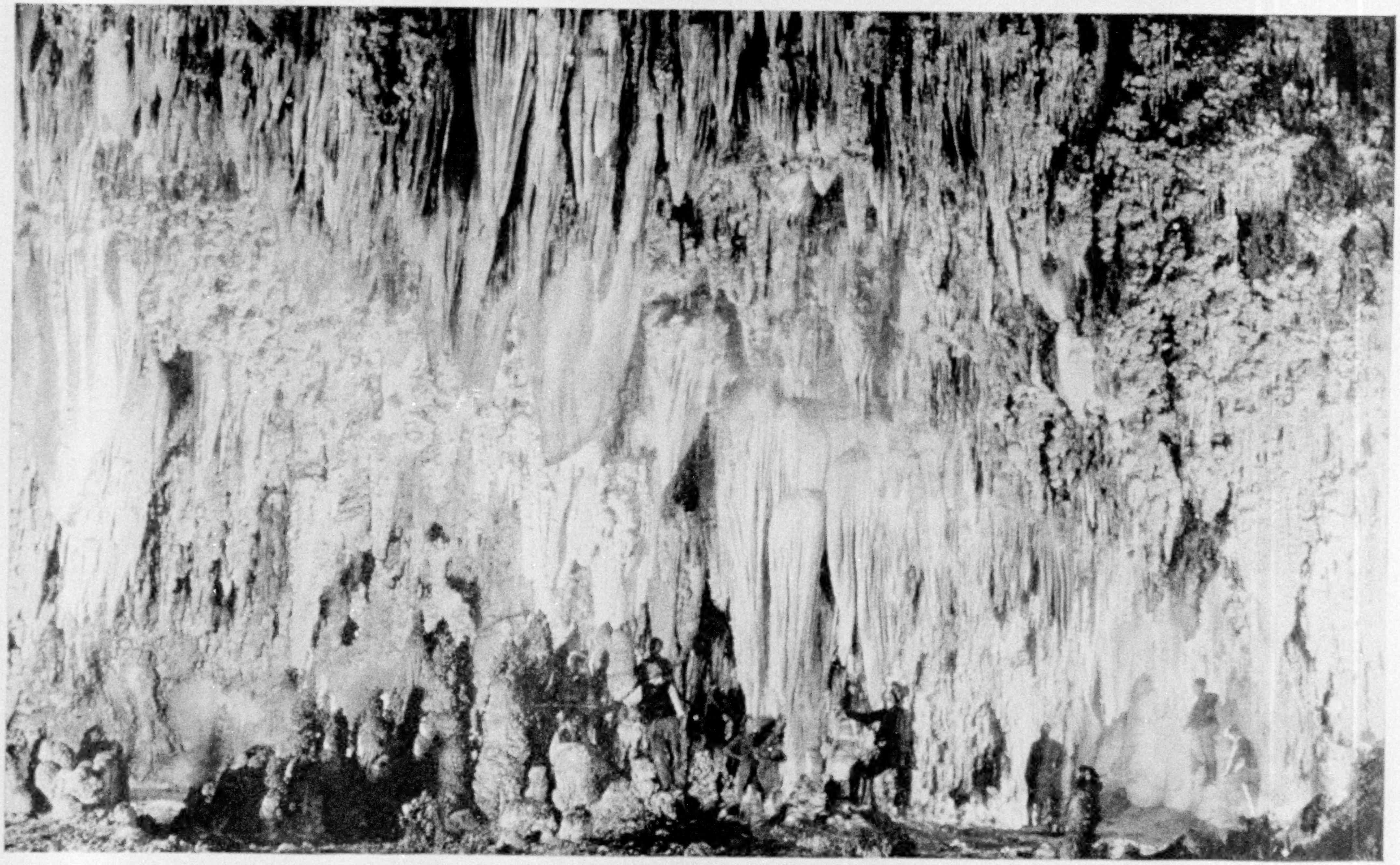
A FALLEN GIANT

This great mass was jarred loose from the roof; whereupon it became the base for the newly formed stalagmites, at the top of the picture. Another generation of stalactites may be seen at the left.



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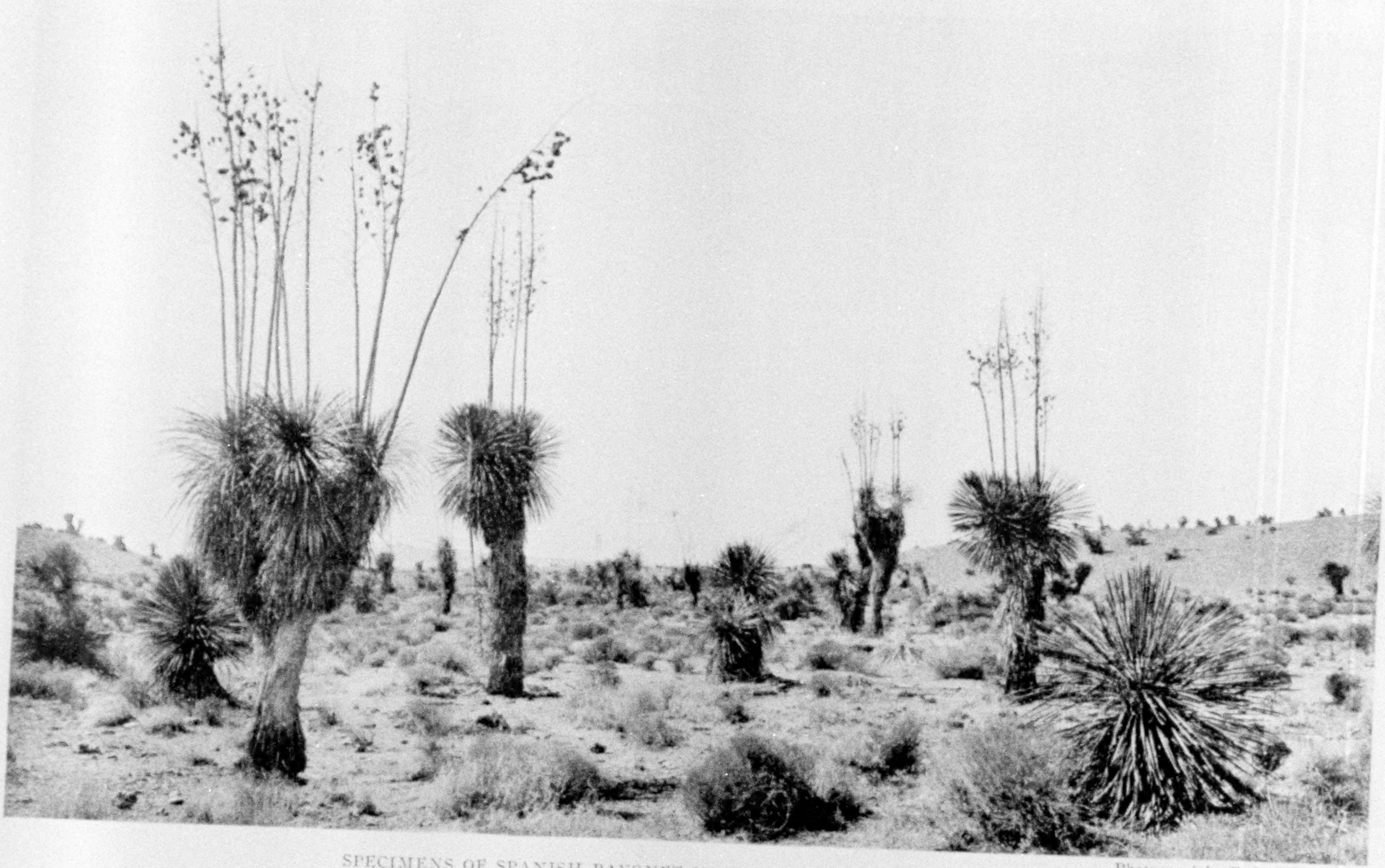
A PROFUSELY ORNAMENTED CORNER IN THE CAVERN

Mindful that the Romans peopled caves with nymphs and sibyls, and that to the Greeks they were temples, Mr. Lee would draw upon Indian mythology in naming the compartments of Carlsbad Cavern. He suggests that this chamber be called Shinav's Wigwam, for the great wolf god of the Navajo, whose broken arrows are now found as petrified tree trunks. The Petrified Forest of Arizona is said to be the battle ground of Shinav.



SPECIMENS OF SPANISH BAYONET IN THE DESERT OF NEW MEXICO

Photograph by E. O. Wooton

There are more than a dozen species of yuccas on the arid spaces in the American Southwest and Mexico. The *Yucca elata*, shown here, has leaves twenty or thirty inches long, ending in a sharp point. The trunk is covered with a thatch of the dried pendant leaves and the roots penetrate deep into the soil. After the blooms have fallen, the fruit comes as an oblong capsule, ending in an abrupt point.

insecurely anchored furnishes a handhold of questionable value.

Let the man of unsteady nerve, whose foot is untrained for difficult climbing, keep out of Yeitso's Den until a safe passageway is constructed. Into this den we slide and otherwise lower our weary bodies to a shelf beneath which the pit continues into the blackness to some unknown depth.

After a brief rest, we start the ascent out of the pit, but fortunately the rise on this side is only 90 feet. Possibly the inky blackness is advantageous here, for the torches illuminate only one difficulty at a time. If the whole 90 feet of that ascent were illuminated at once, few tourists would see the marvels awaiting them beyond. Only a hardy climber would undertake it. We draw our weary feet up from shelf to shelf, securing a handhold here and a doubtful toehold there, as a minute niche in the rock or some tiny projection is patiently indicated by the guide.

Our labors are by no means at an end when we reach the top, for almost immediately we start down another declivity, clambering over angular rocks and crawling through low, narrow passages.

Soon after leaving Yeitso's Den we enter the spectacular part of Carlsbad Cavern. Here we find chambers of unbelievable dimensions. Our way leads ever downward, over enormous jagged blocks of limestone fallen from the roof. One of these blocks, estimated as more than 100 feet in diameter, is partly buried by smaller falls. It creates much trouble, for our pathway, if such it may be called, leads under and over and around the blocks, ever downward through the jumbled mass. One of the party jocularly likens us to a train of ants making its way through a brick pile.

The chambers in this part of the cave are several hundred feet wide and the vaulted ceiling so far above us that in some places we are not able to see it, much less estimate its height. It seems like gazing upward on a cloudy night. Our feeble lights only magnify the void.

### A REGAL CHAMBER AND ITS ANTEROOMS

At the foot of a great heap of rocks 700 feet below the surface at the entrance, we enter one of the spectacular parts of Carlsbad Cavern. Three large chambers here open off the main hall. The largest may be called Shinav's Wigwam in honor of the kingly warrior of Navajo mythology. Because of its size and the glory of its decoration, this great chamber may appropriately be likened to the glorified wigwam of the great wolf god Shinav, who in battle used petrified trees for arrows.

The third and smallest of the three rooms is subcircular in outline and is 160 feet long by 140 feet wide. The middle room is about three times this size and the first one much larger. No measurements were made of the larger rooms.

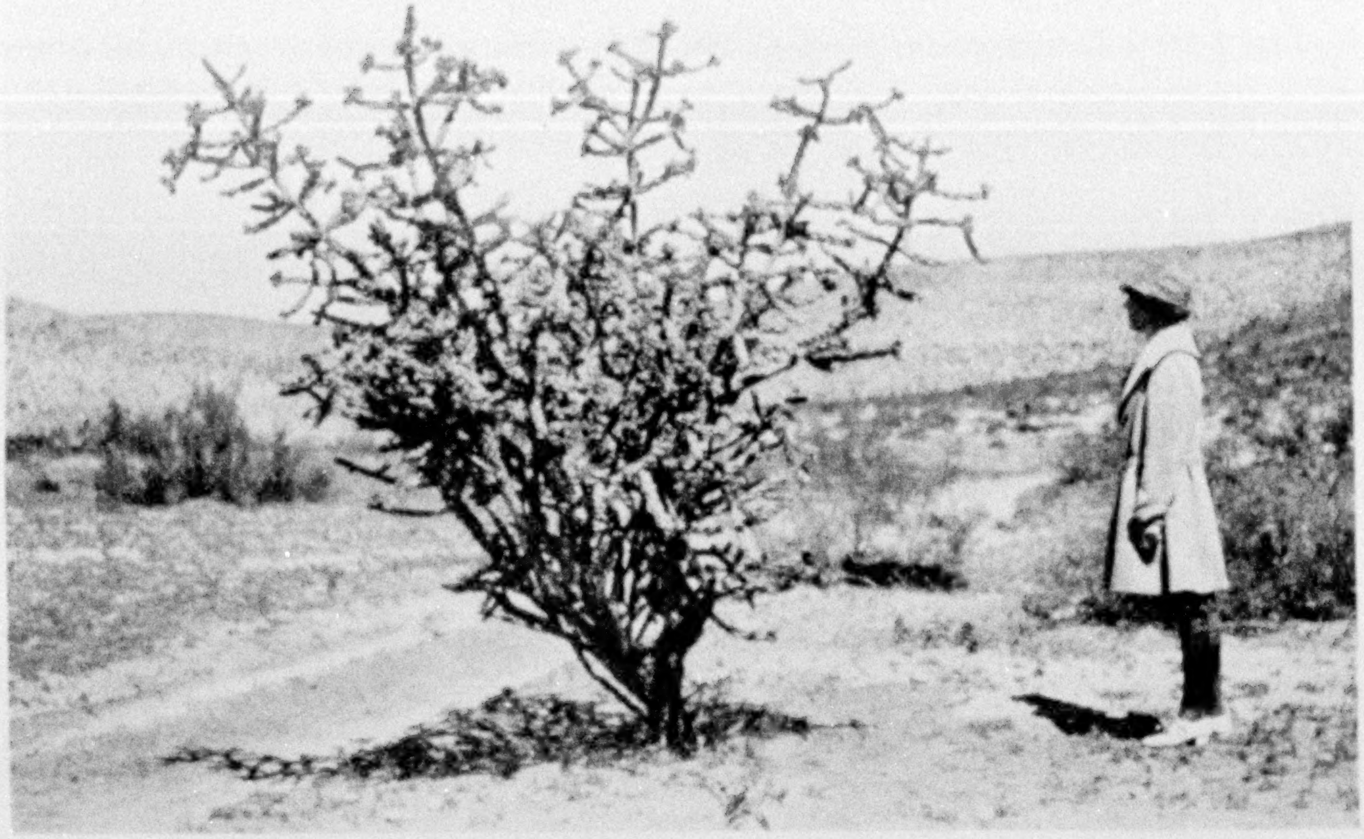
### CURTAINS OF GLEAMING ONYX

The chambers about the Wigwam are separated from the master room by curtains and partitions of gleaming onyx formed by deposition of lime carbonate from waters dripping from the roof. The great dome is so high that it is only dimly illuminated by the torches.

Most of the ceiling is covered with dripstone. Thousands of stalactites hang singly, in doublets, in triplets, and in groups. They range from a few inches to lengths representing the entire height of the room, and in diameter from that of a small pencil to masses many feet thick. In some places they hang so thickly that they coalesce at the top, forming spiny masses weighing thousands of tons. One observer likens these bristling clusters of sparkling onyx to porcupines in postures of defense.

The stalagmites are not so numerous as the stalactites in this group of chambers. There are some notable masses of onyx rising as mounds and monuments from the general level, but over surprisingly large areas, the floor is smooth and one can wander at will under and among the myriads of pendants, until the eye tires and the mind flags. A few objects of wonder are inspiring, but too many become wearisome.

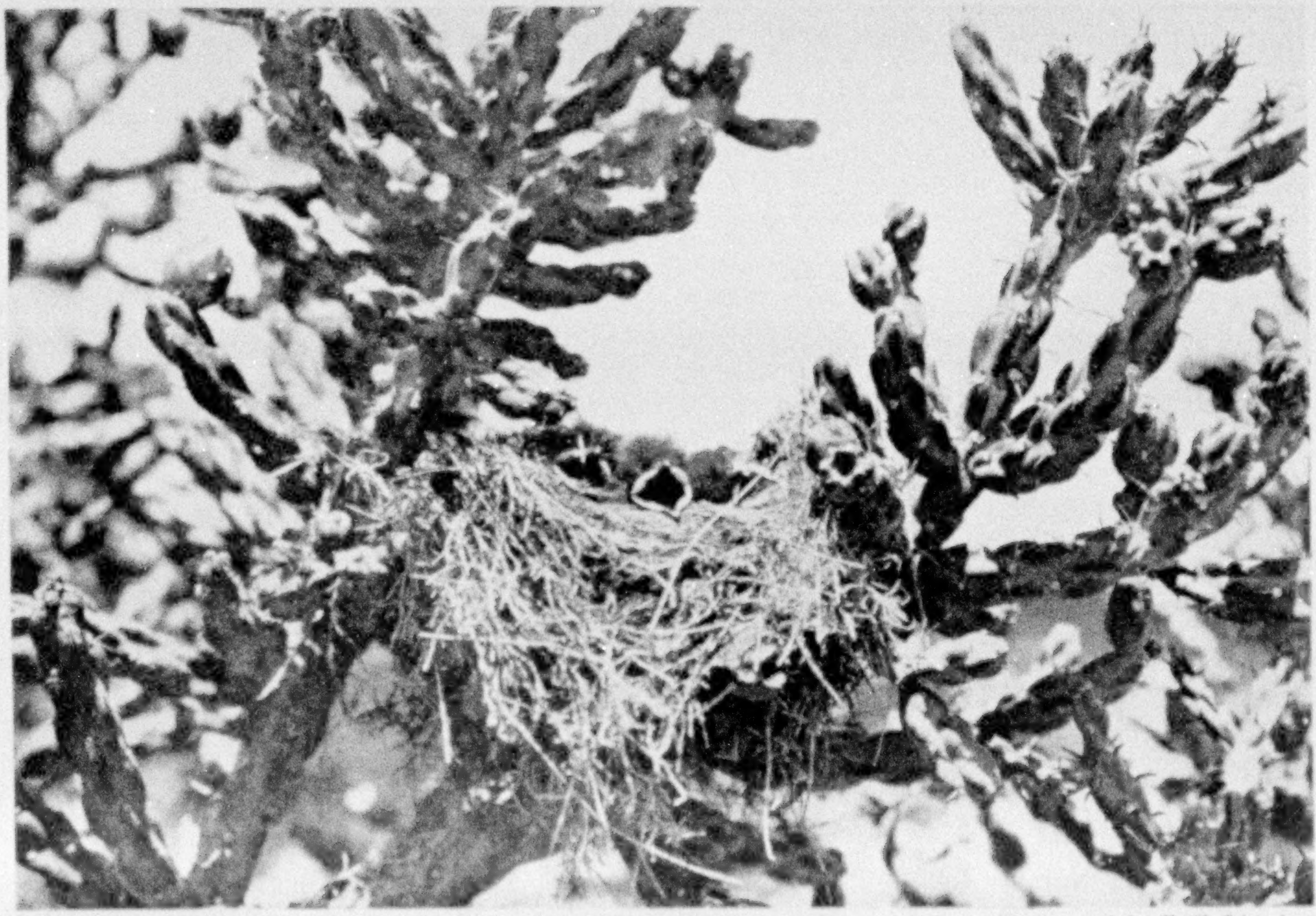
In places the stalactites have grown together laterally and formed "curtains." Some of these reach the floor, others seem partly raised to reveal a stage set with actors of fantastic aspect. Fortunately, this cave is so little known that the



Photograph by Willis T. Lee

WHERE THE WALKING STICKS COME FROM

This cactus (*Opuntia imbricata*) is a characteristic plant in southern New Mexico. It is commonly called cane cactus because of its use in making walking sticks.



Photograph by F. E. Lloyd

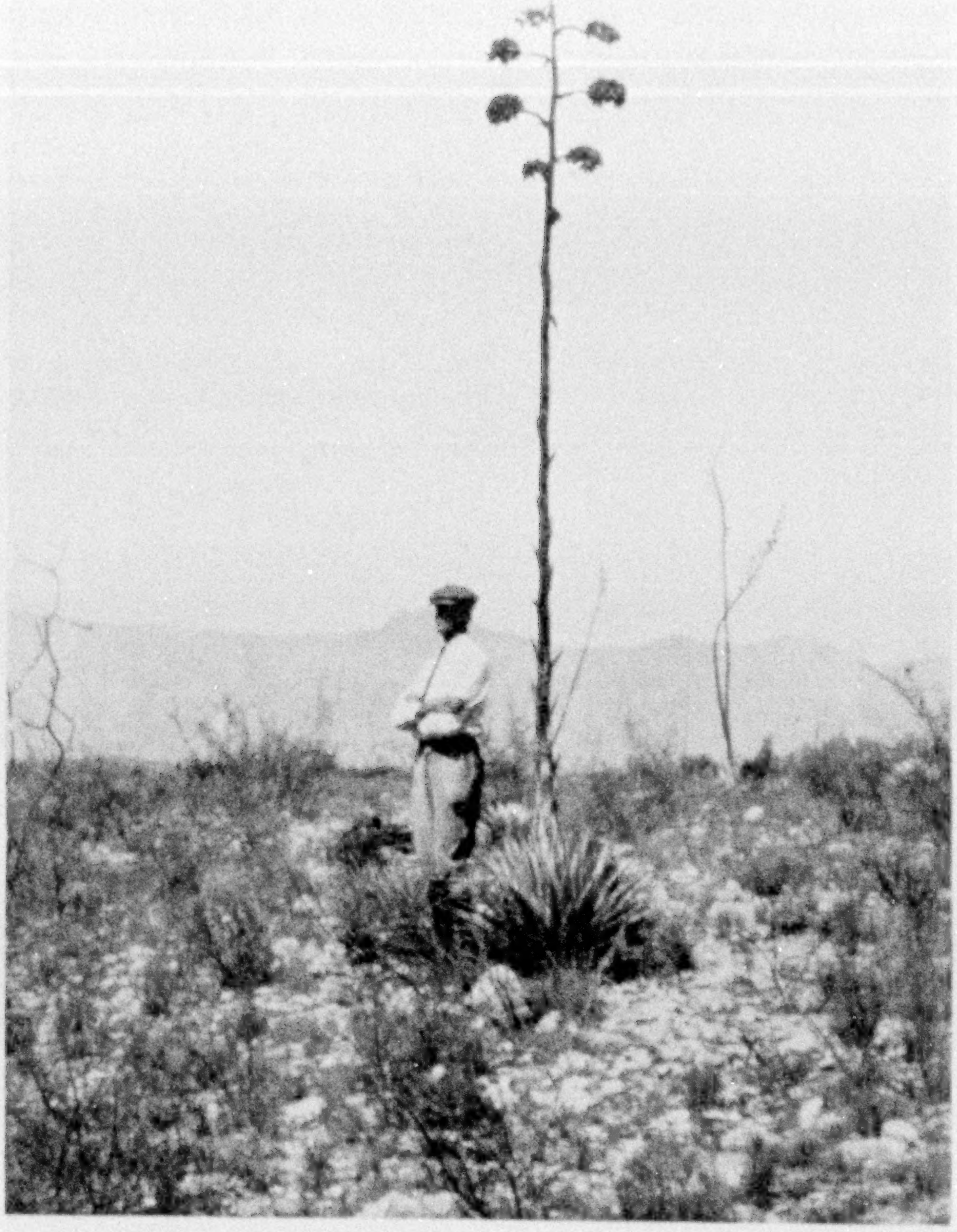
A NATURAL BIRD SANCTUARY IN A FRIENDLESS LAND

The spiny branches of the cane cactus afford safe shelter to birds and are used extensively by them for nesting. Predatory animals in search of eggs or young birds usually go hungry rather than brave the needle-like cactus spines.

unusual forms have not yet been marred by fantastic names born of an overstrained imagination.

No chasm yet bears the name of Pluto, and Diana seems never to have bathed in any of the fountains; there are no Tombs of the Martyrs, and even Cinderella seems never to have visited Carlsbad. It is to be hoped that these worthies will remain absent and that appropriate names may be given before the cavern is opened for general tourist travel.

One member of our party suggested that, as the cave is in territory recently inhabited by Indians, the myths of these tribes, which have already been drawn upon for some names, might appropriately furnish all names for the objects within it. The list of Indian deities and fabled heroes might be utilized and some of the natural monuments might be named in commemoration of their fabled deeds.



Photograph by Willis T. Lee

CENTURY PLANTS IN FRUIT AND CREOSOTE BUSH ON THE PLAIN EAST OF GUADALUPE MOUNTAINS

The generic name of the creosote bush (*Covillea tridentata*) was given in honor of the botanist, Dr. Frederick V. Coville, Chairman of the Research Committee of the National Geographic Society.

In some places the dripstone of the curtains reaches the floor and forms solid partitions between the rooms. Some of the side chambers are entered through narrow openings in these partitions; others through wider passageways.

### A ROOM MORE THAN HALF A MILE LONG

One small chamber off Shinav's Wigwam has been called the "Crow's Nest." It is 50 feet in diameter and so thickly set with slender stalactites that one could not pass through it without destroying scores of the delicate pendants. The stalagmitic growths rising from the floor are scarcely less varied and delicate.

The most spectacular part of the cavern is reserved as the final scene of an eventful trip. Leaving the Wigwam, we retrace our steps for a short distance, climb a steep hill, make our way laboriously at snaillike pace through heaps of fallen rock and over ledges where the guide patiently shows the bewildered climber which foot to put forward in order that the next step may be taken safely. After a half hour's struggle we enter the Big Room (see illustrations, pages 4 and 12).

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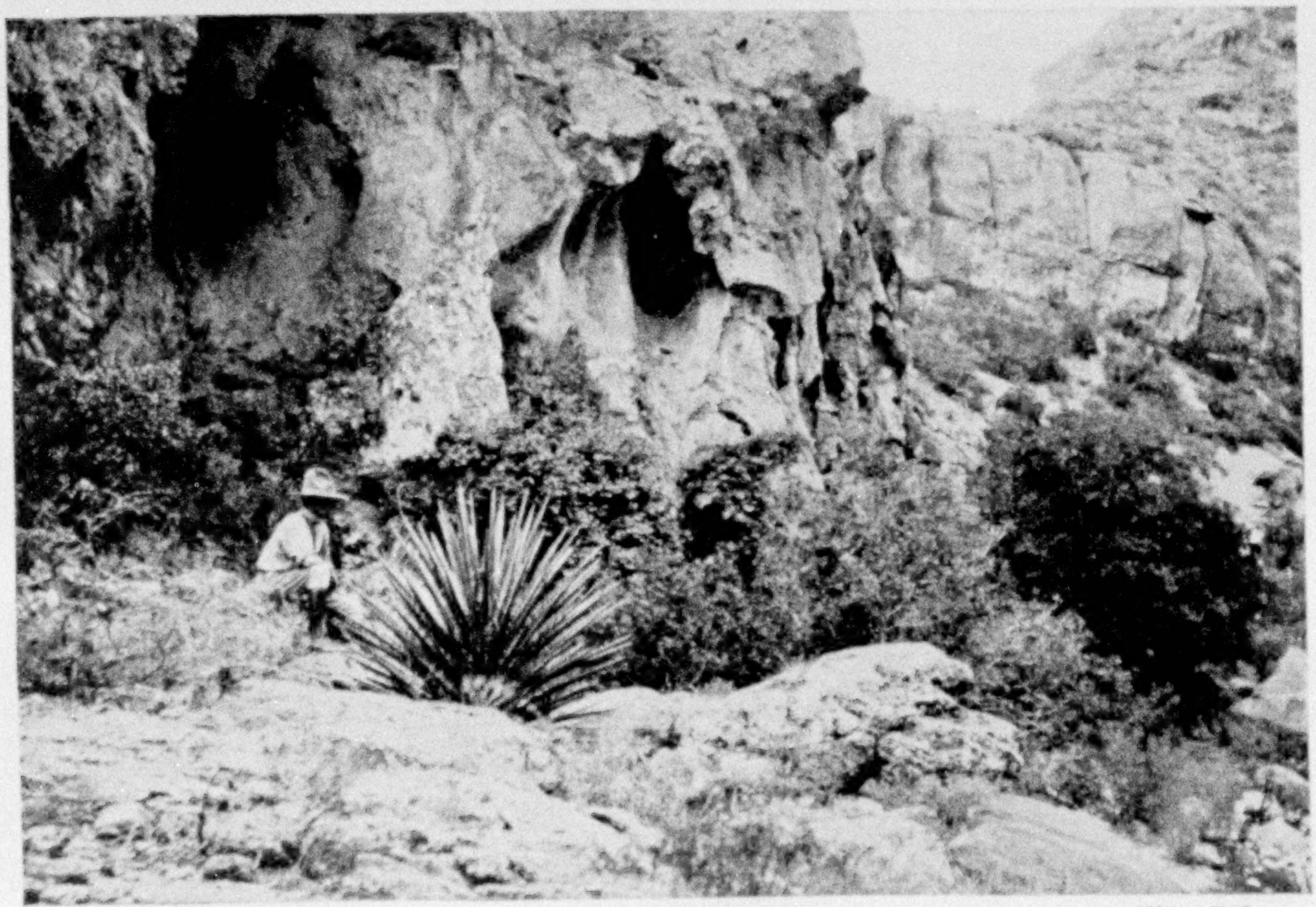
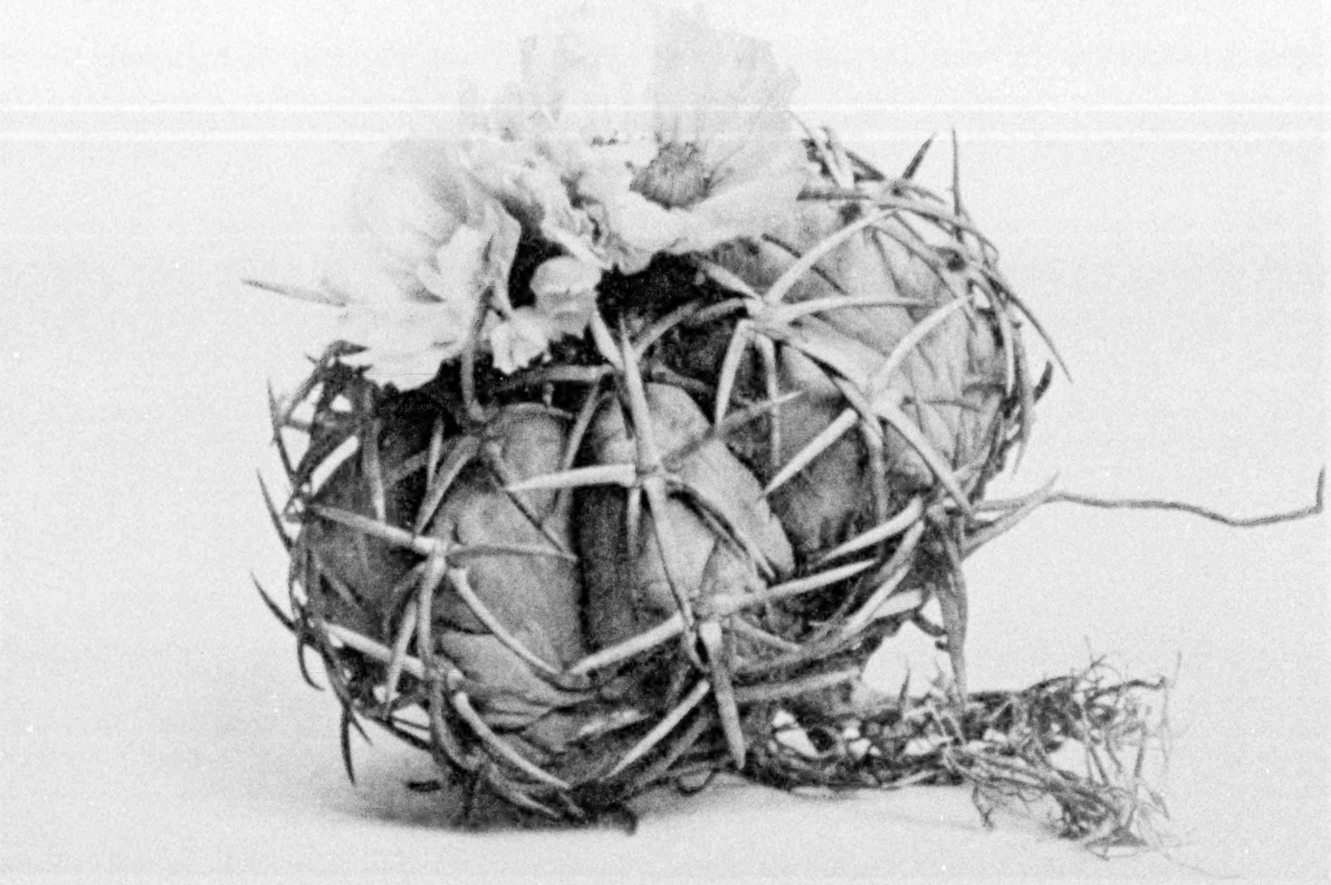
SOTOL PLANTS NEAR THE MOUTH OF CARLSBAD CAVERN (SEE TEXT, PAGE 32)



Photographs by Willis T. Lee

ROCKS AND DECORATIONS IN THE LAST CHANCE CANYON

The ancient rocks of the canyon wall (to the right) are draped at the left with a thick mantle of lime carbonate, deposited by the water which in ages past issued from the mouth of some cave. The waters no longer flow here, having found an easier passageway through the rocks. The mantle of flowstone remains, decorated by ferns, green shrubs, and a rosette formed by the bristling spikes of a century plant.



Photograph by William Edwin Safford

A CACTUS IN BLOOM

This cactus (*Echinocactus horizonthalonius*) is common near the mouth of Carlsbad Cavern. The fleshy mass of the species is used in the manufacture of candy.

I doubt if a name more appropriate than Big Room could be found for this remarkable opening. It is more than half a mile in length and will probably average many hundreds of feet in width. The sides recede in places to such great distances that our lights failed to illumine the walls. A few side trips revealed alcoves uninterrupted for hundreds of feet, but none of these has been thoroughly explored.

Repeated effort was made to obtain some concrete idea of the height of the irregularly arched ceiling. In a few places the rocks above us were revealed by the torches, and it was estimated by several members of the party as more than 200 feet above us. In other places even the spotlight from a strong electric torch failed to pierce the gloom and no ceiling could be discerned.

The Big Room has astounding proportions. Had I been told before entering it that an open space of such great dimensions was to be found underground, I should have doubted my informant's word as frankly as many of my readers probably will doubt mine.

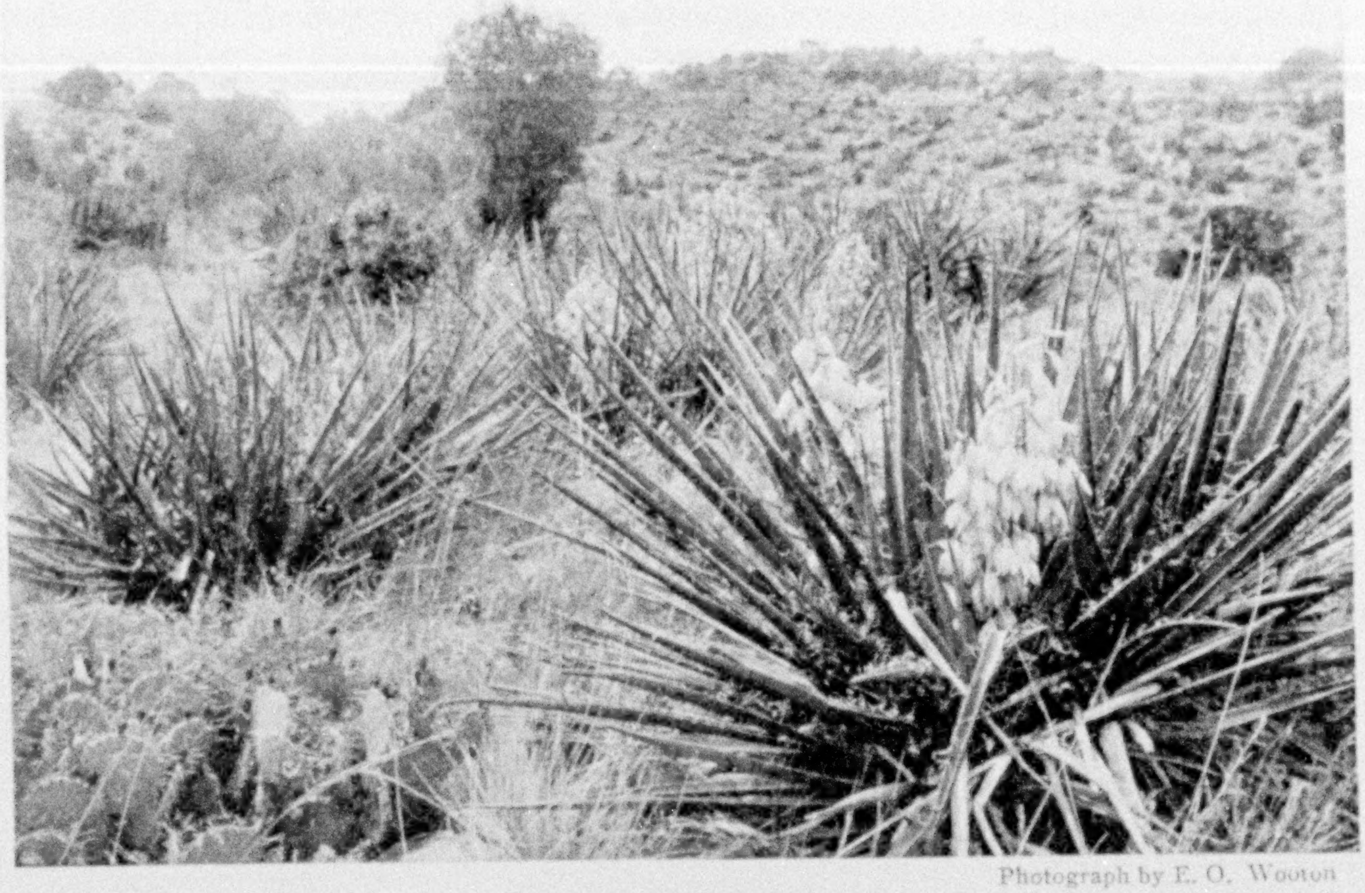
Some visitors who claim familiarity with noted caves assert that Carlsbad Cavern surpasses all others in size and in the beauty and variety of its decorations. It seems probable that this claim may be substantiated when an adequate survey and extended examination are made.

### NATURAL DECORATIONS OF DELICATE DESIGN

The Big Room is probably as remarkable for ornate decoration as it is for size. Dripstone decorations occur in infinite variety of size and shape. There are thousands of pendants, some so delicate and slender that they break under the slightest pressure; some so massive that one marvels that the enormous weight is sustained.

The stalagmites, rising from the floor like monuments in a churchyard, are no less varied. One group, in which the forms are unusually tall and graceful, has been called the Totem Poles. Some, only a few feet in diameter, rise to an estimated height of 50 feet (see page 16).

Many of the stalagmites in this part of the cave have blunt, rounded ends and are



Photograph by E. O. Wooton

ONE OF THE NUMEROUS SPECIES OF SOAPWEED OF THE SOUTHWEST

The *Yucca baccata* is one of the numerous species of plants of the southwestern part of the United States containing saponin, a chemical found in the roots, stems, and other portions of the plant which removes dirt from hair and woolen goods. A machine has recently been invented which chops up the stalks of several varieties of yuccas to be used as emergency food for cattle.

composed of material which seems to differ from that of the surrounding forms. They appear dark-colored and contrast sharply with other forms in having a smooth surface in place of the chalky white frostwork surface which is more common.

In the dim light these rounded masses resemble ice—a resemblance which becomes somewhat realistic when one undertakes to climb over the wet, slippery surface.

Some of the stalagmites are of unusual dimensions. The "Twin Domes" are said to be more than 100 feet high and to measure more than 200 feet across the base.

This base is a mammoth dark-green mound having a wet, slippery surface. The mound is surmounted by the two conspicuous pillars of light cream color, covered with myriads of tiny grooves and projections, which cause them to sparkle and glitter as the torchlight plays on them.

Some of the most interesting features in the floor of the Big Room are grouped about the basins of extinct springs. Some of the basins are 10 feet or more in depth and perhaps 50 feet across. They are lined with an unknown thickness of onyx and in their profuse decoration closely resemble some of the hot springs in Yellowstone National Park.

If the Biscuit Spring in Yellowstone were drained, leaving the surrounding crust of mineral matter undisturbed, it would resemble one of the basins in Carlsbad Cavern. The interior of each fountainlike basin is covered with delicate fretwork, and the rim appears now just as it was built out long ago by overflowing water, into a variety of forms.

A type of decoration frequently seen is called by some toadstools, and by others is likened to lily pads. Each pad consists of a thin sheet of onyx which grew from a center in concentric rings outward to a knife-edge. These sheets are a foot or

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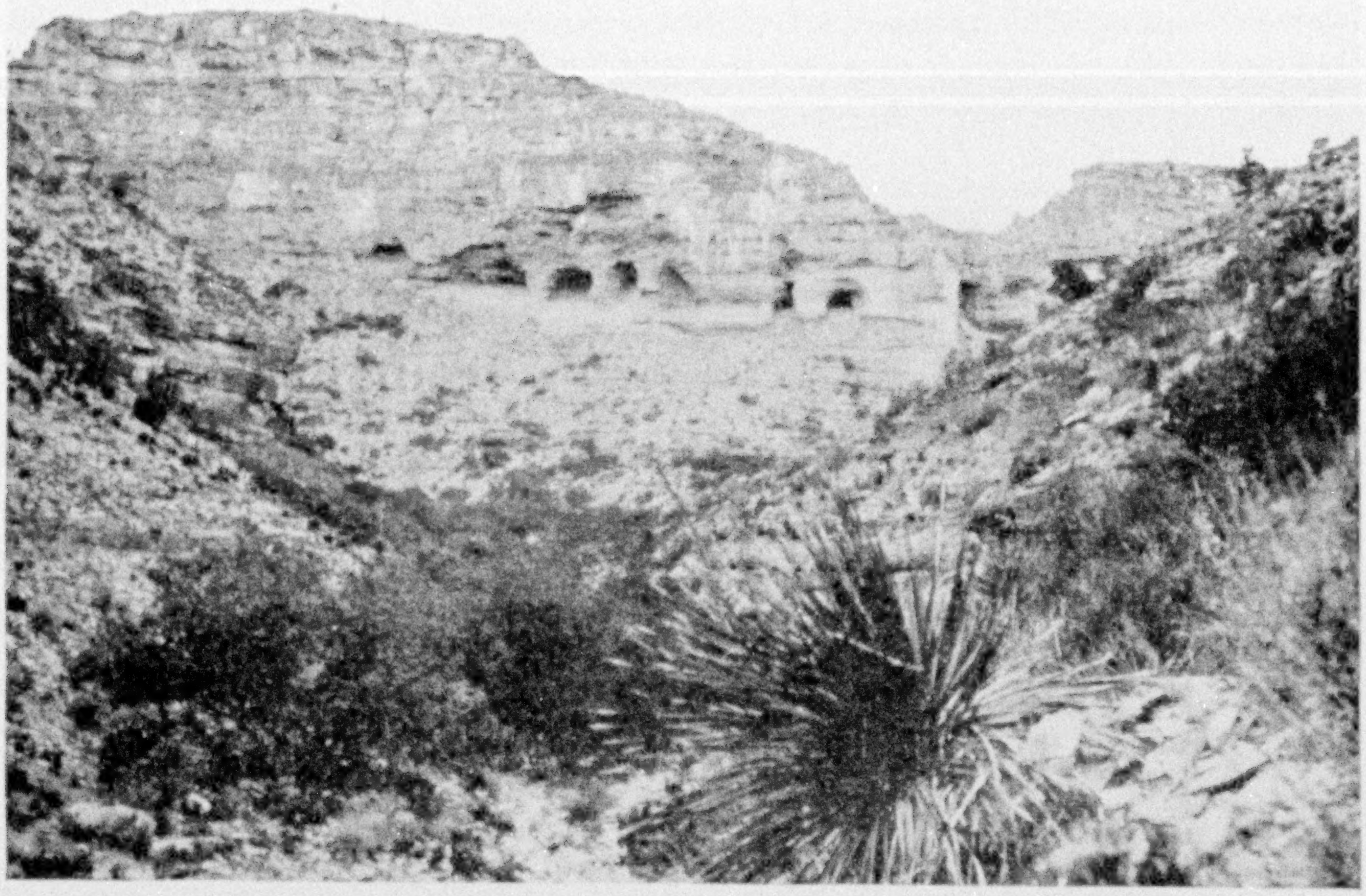

Photograph by Willis T. Lee

AN ANCIENT BURIAL PLACE

The wall of Last Chance Canyon, near Queen, New Mexico, shows openings in the limestone of the canyon wall where bones of prehistoric men were found. Few of the openings have been examined, as they can be entered only with ropes and ladders. Some of them may lead into caverns. In these well-protected shelters the ancient inhabitants of the Guadalupe Mountains, who lived and died before the time of Indian occupation, tenderly laid away their dead in baskets made of the leaves of the sotol plant (see text, page 32). Some of the bones and baskets have been taken from these sheltered nooks; others remain untouched. The sotol plant has survived its ancient users and still thrives in these mountains. One of these plants appears prominently in the foreground.

two across and each rests on a strong pedestal. The edge of the "lily pads" represents the former level of the water in the fountain. Now that the basin is dry, they stand forth like campstools.

Our entire party entered one of these dry fountains. Each member selected the camp chair which best suited his fancy and seated himself on it for a few minutes' rest before resuming the journey (see page 18).

In many places stalactites and stalagmites have joined to form columns of impressive dimensions. No measurements of them have been made. I hesitate to estimate the height and diameter of these great pillars. Some day they will be measured. I can only say that they impress me as very high, very large, and very astonishing (see page 11).

Near the end of the Big Room is a small opening in the floor for which the name Nalin's Hogan has been suggested, as in Apache myth, Nalin or Night Girl is the Goddess of Death. Into the Hogan, or earth lodge, the guide, Mr. White, was once lowered about 200 feet at the end of a rope. There he found other chambers and hallways, through one of which flows a stream of clear water.

At the extremity of the Big Room the floor falls away abruptly to a depth of about 100 feet in a great depression 200 feet across. Some have applied the name Dante's Trail to this hollow; others call it Shipapu's Hole. The latter name recalls the hole in the ground where, according to Indian myth, the Pueblo Indians originated.

At Shipapu's Hole our pathway suddenly ends. No man has ever yet ventured into this great sunken portion of

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the cavern. Here, too, our journey ends, for the guide reminds us of the difficulties in retracing our steps. Reluctantly we return, snatching hasty glimpses of scores of objects as fascinating as those already seen. The surface is reached just at dusk, where, in spite of the hard homeward journey ahead, we watch for a time the swarm of bats leaving the cavern.

### AMONG MOUNTAINS OF RUGGED BEAUTY

The cavern alone is a noteworthy addition to the exceptional variety of geographical wonders of the United States, each distinctive of its kind, but fortunately it is surrounded by features which enhance its future scenic value. Few persons now traverse southeastern New Mexico and few realize that mountains rise there to altitudes of nearly 10,000 feet. Moreover, these mountains are carved, by erosion, into a remarkable series of sharp ridges and steep-walled gorges which are scarcely surpassed for rugged beauty.

The rocks of these mountains consist of limestone of late Paleozoic age, in thick, massive layers which slope gently in an easterly direction and pass under red sandy shale in Pecos Valley. The shale contains thick beds of gypsum and rock salt, which dissolve in the circulating underground water.

The limestone also is soluble, but less readily than the salt and gypsum, and because of its greater resistance to the action of the water, the caverns in it are formed slowly, but become enormously large, and endure through long ages.

Carlsbad Cavern is only one of a dozen or more known to exist in Guadalupe Mountains, although little aside from their mere existence is known of these, even locally. Here is ample opportunity for adventurous spirits who are looking for unknown regions to explore.

The plants near Carlsbad Cavern are of great interest to those unfamiliar with the Southwest. This part of New Mexico has a warm, semi-arid climate in which thrive a variety of plants of amazing shape. These give to the landscape a strange aspect that is a source of never-ending delight to the visitor. However, to those for whom the novelty has worn away, these weird forms of vegetation are sources of annoyance and discomfort.

The predominating characteristic is thorniness. There are thorn bushes and thorn trees; thorned shrubs with spike-like leaves; Spanish bayonets and Spanish daggers. This is a country of prickly pears and cat's claws; sagebrush and greasewood; thorny mesquites and screw beans, and many less familiar but no less interesting forms of plant life.

The beauty of a cactus in bloom and of the great flower stalk of the century plant is well known, but the equally gorgeous appearance of many of the other plants when in fruit or in flower is less familiar.

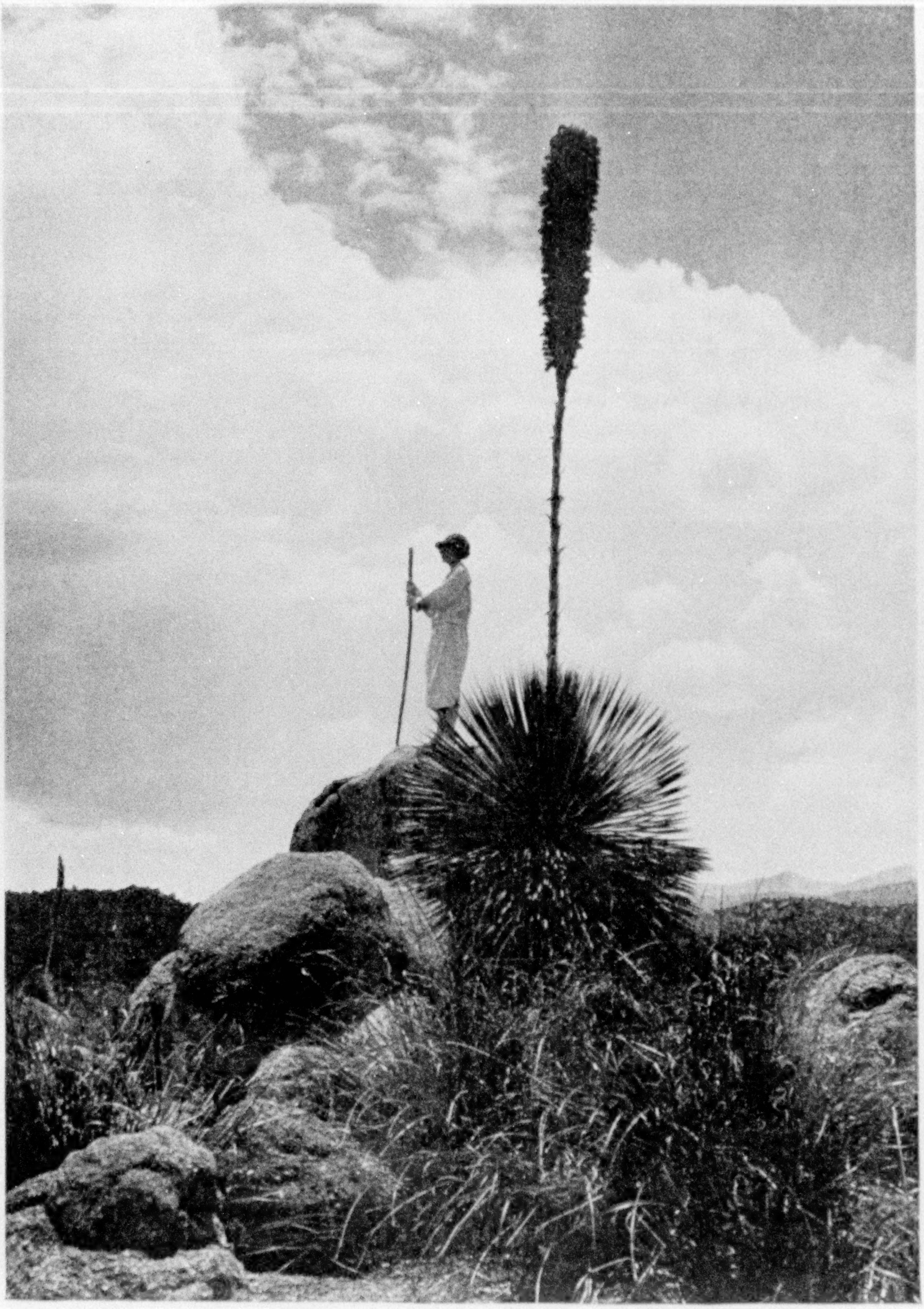
Probably the most interesting plant near Carlsbad Cavern—certainly the most prolific one—is the sotol, of which there are many closely related species. The one which grows luxuriantly near the cave and adorns the barren, rocky slopes is known as *Dasylirion leiophyllum*. It consists of a spongy base a few feet high, crowned with hundreds of linear leaves about a yard long and half an inch wide, armed on both margins with numerous sharp recurved teeth. The leaves thus resemble blades of a jig saw, except that both edges are armed with teeth (see illustrations, pages 28 and 38).

Occasionally a plant is seen with a fruit stalk emerging from the center of the leafy crown, but most of them are without fruit stalk, for the plant dies after fruiting.

### THE SOTOL HAS MANY USES

The sotol is useful in several ways. The heart of the leafy crown resembles a cabbage; and this, as well as the spongy interior of the short, thick trunk, makes excellent food for cattle when the toothed leaves are removed and the plant split open.

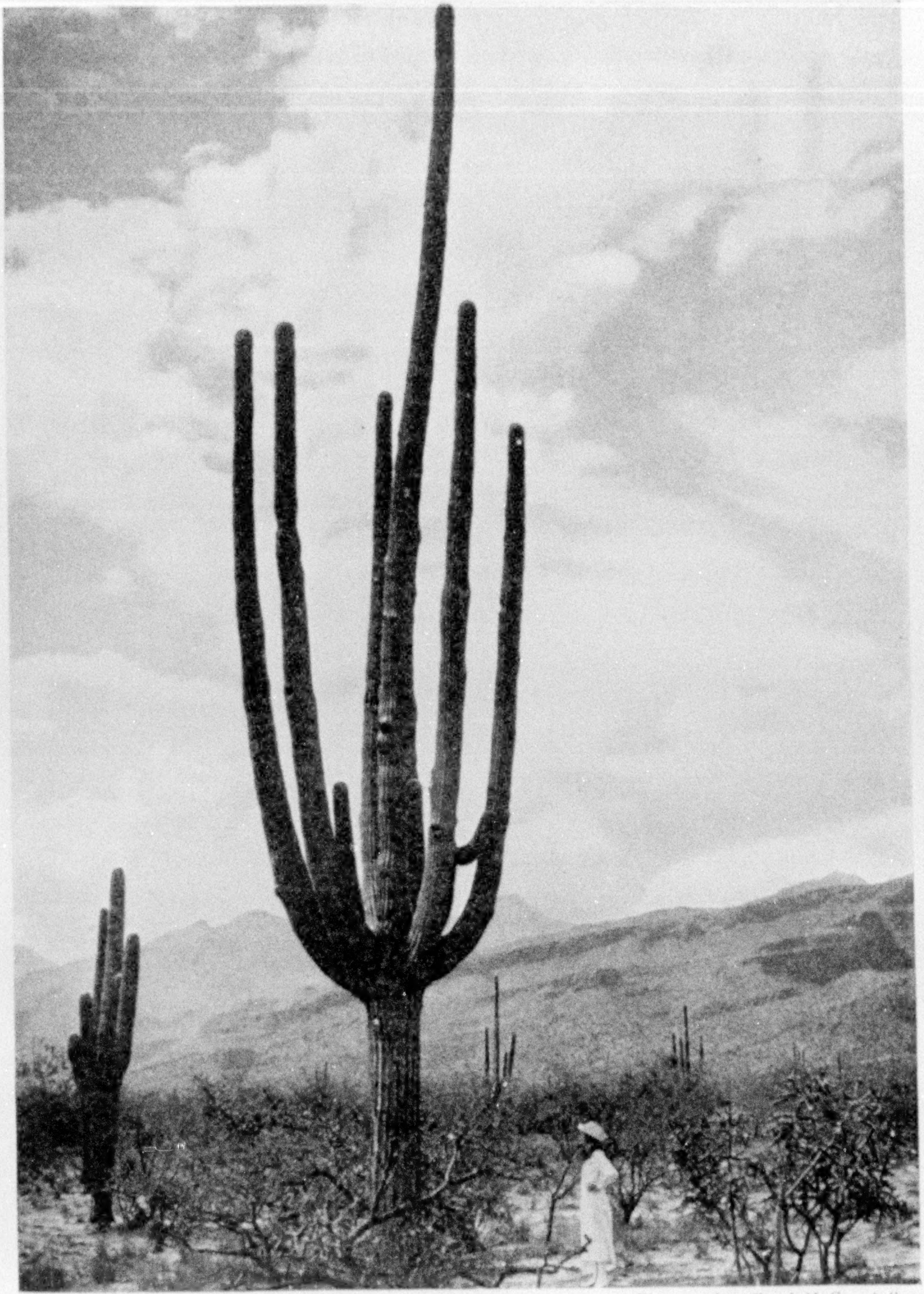
Sotols were formerly used as food by the natives, who roasted or boiled the heads after removing the saw-blade leaves; also, from the fermented trunks is distilled an intoxicating drink called "sotol." The long, tough leaves are used for thatching and for making baskets, mats, and rough cordage. These uses seem to date back to very early times, for baskets and burial receptacles made of sotol leaves have been found containing skeletons of prehistoric people in caves and sheltered nooks high in the canyon walls of Guadalupe Mountains.



Photograph by Frank M. Campbell

A FLOWER SENTINEL AND ITS NATURAL PEDIMENT

Sotol (*Dasylirion wheeleri*) is a desert plant of the Lily family. From the center of its stiff linear leaves rises a solitary stem terminating in a large spike of inconspicuous flowers. The leaves are chopped off, and the fleshy heads formed by their bases are baked for food and used as the source of an alcoholic liquor of fiery strength, called sotol (see text, page 32)



Photograph by Frank M. Campbell

THIS PLANT IS A BOON TO INDIANS

The Saguaro, or Giant Cactus (*Carnegiea gigantea*), usually has two or three branches, when young only a single shaft; this is an exceptionally tall and multi-branched specimen. The fruit and seeds provide food and drink for the Papago and Pima tribes (see also page 35).

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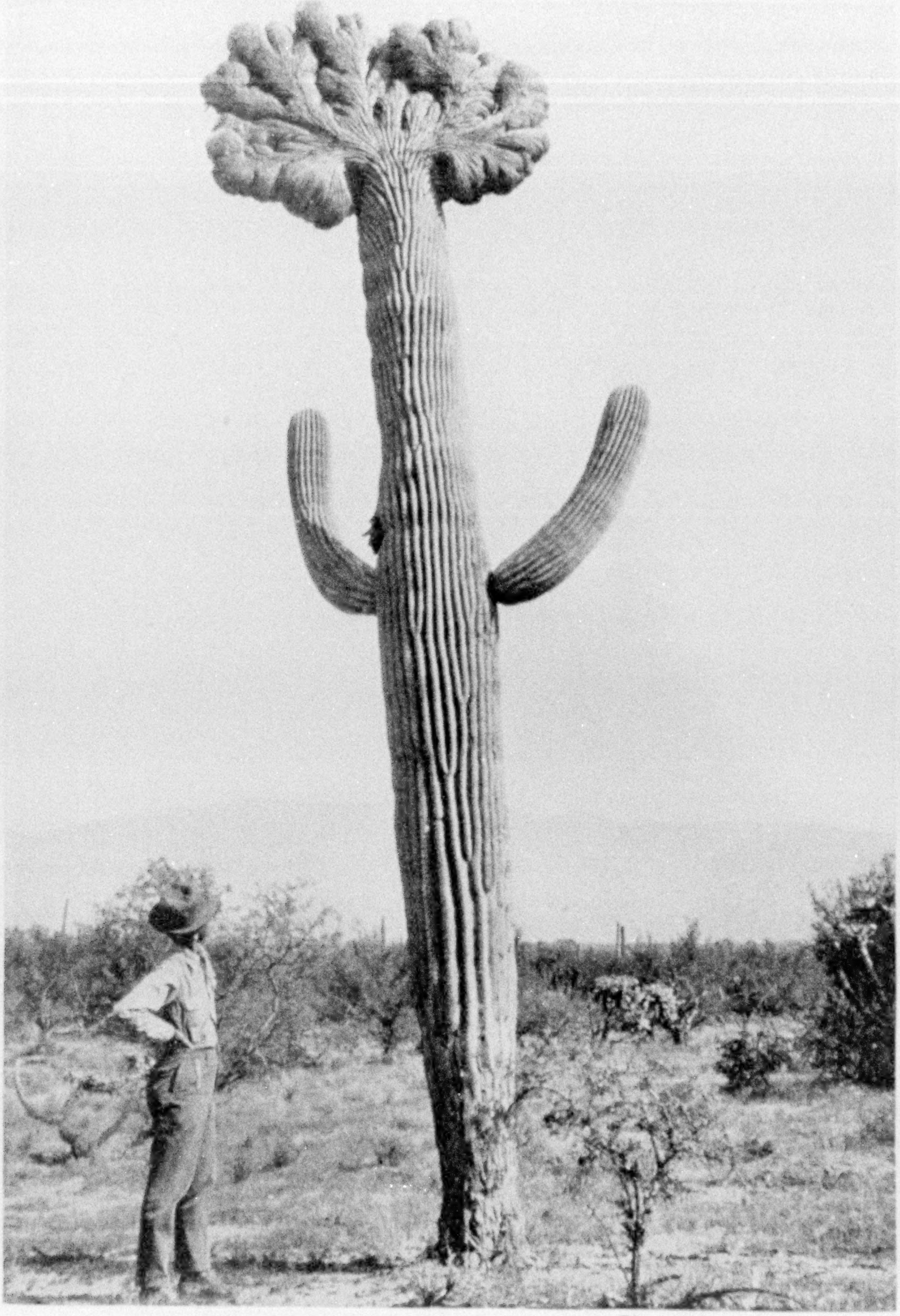

Photograph by Frank M. Campbell

A SPECIMEN OF THE CANCER CACTUS

This form of the Giant Cactus (*Carnegiea gigantea*) is locally called Cancer Cactus because of the abnormally branched top. It is a variation of the type shown on page 34, and is abundant in certain parts of southern Arizona and Sonora, Mexico.

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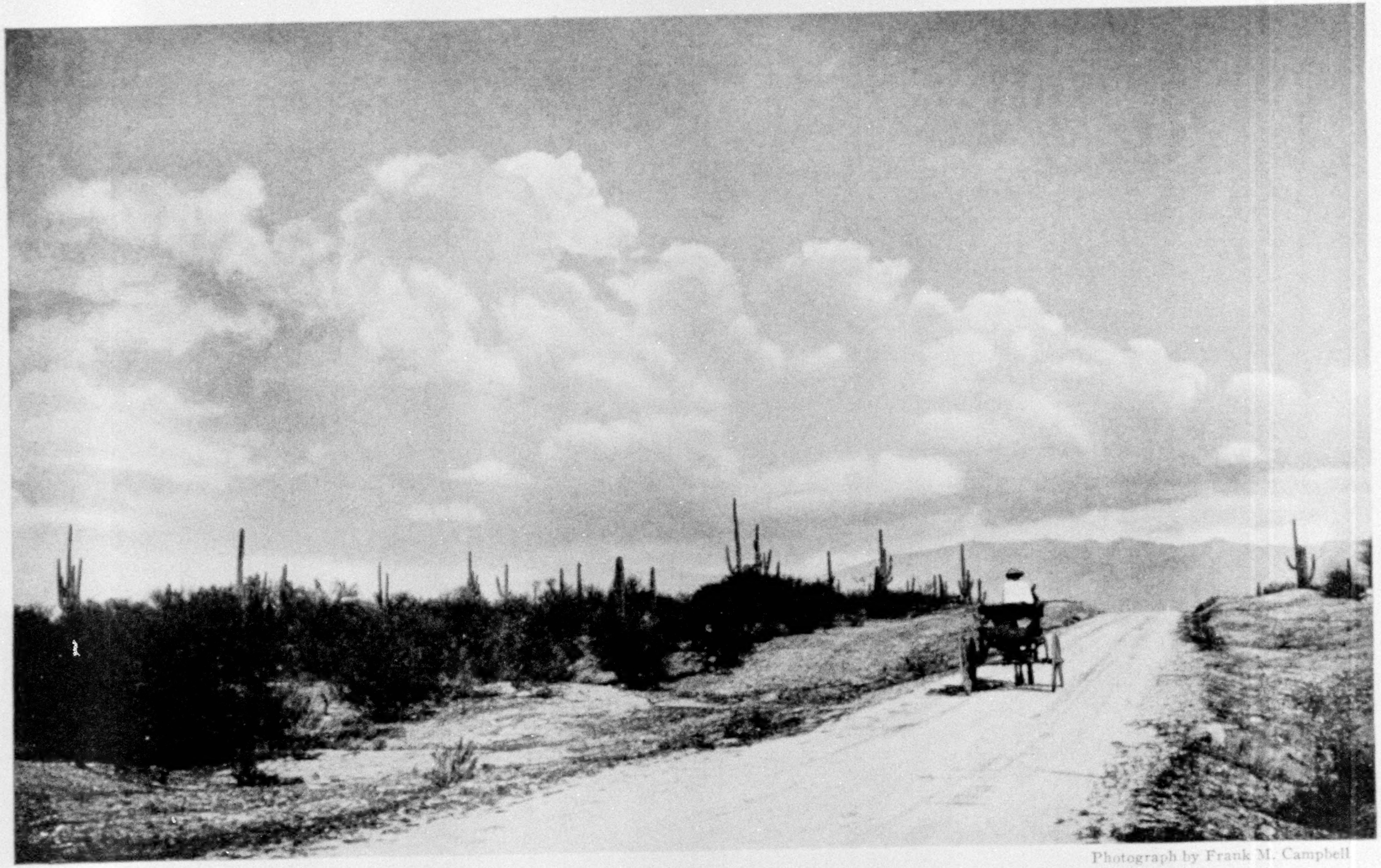
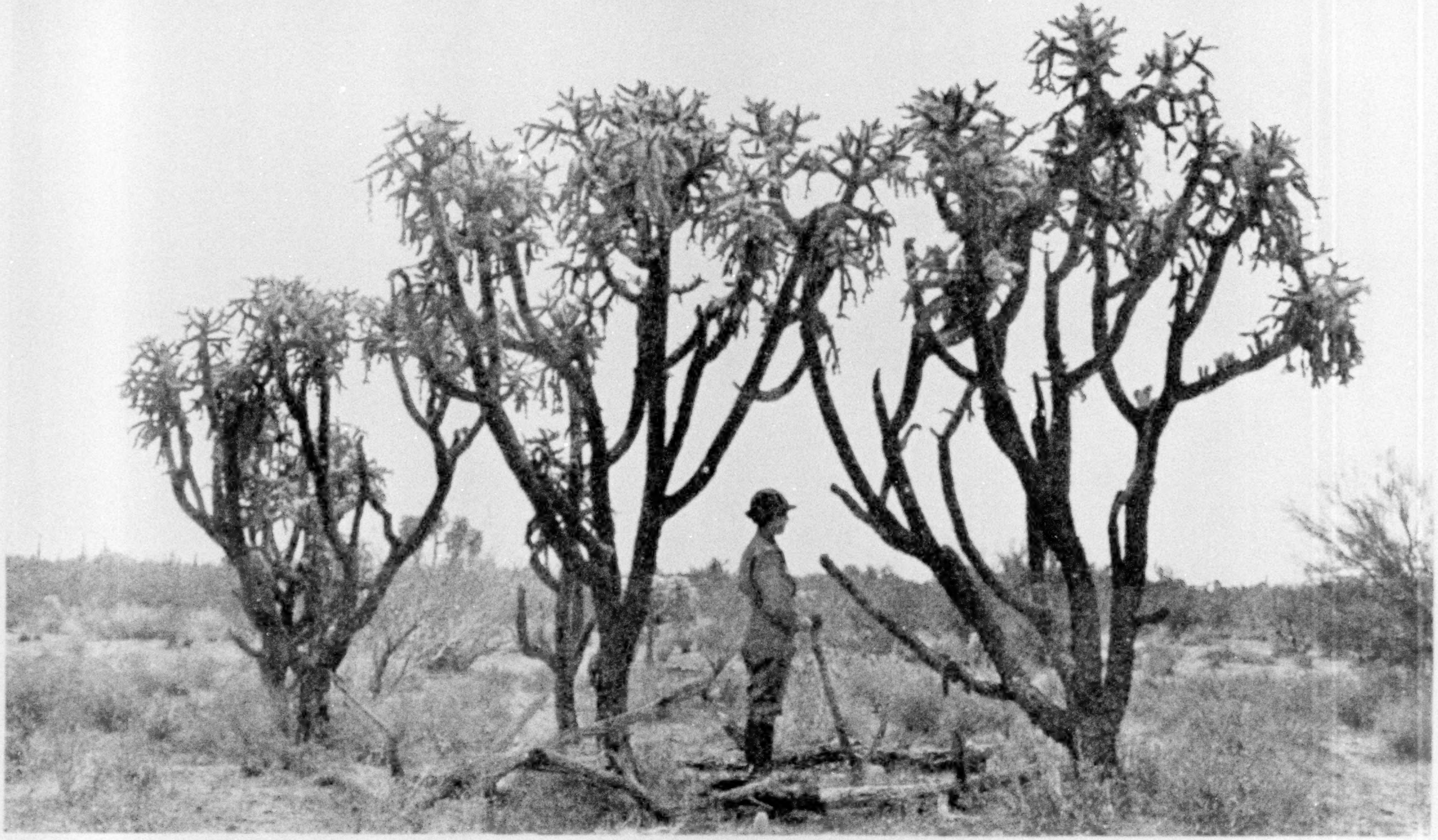


Photograph by Frank M. Campbell

A SAHARA OF GIANT CACTUS

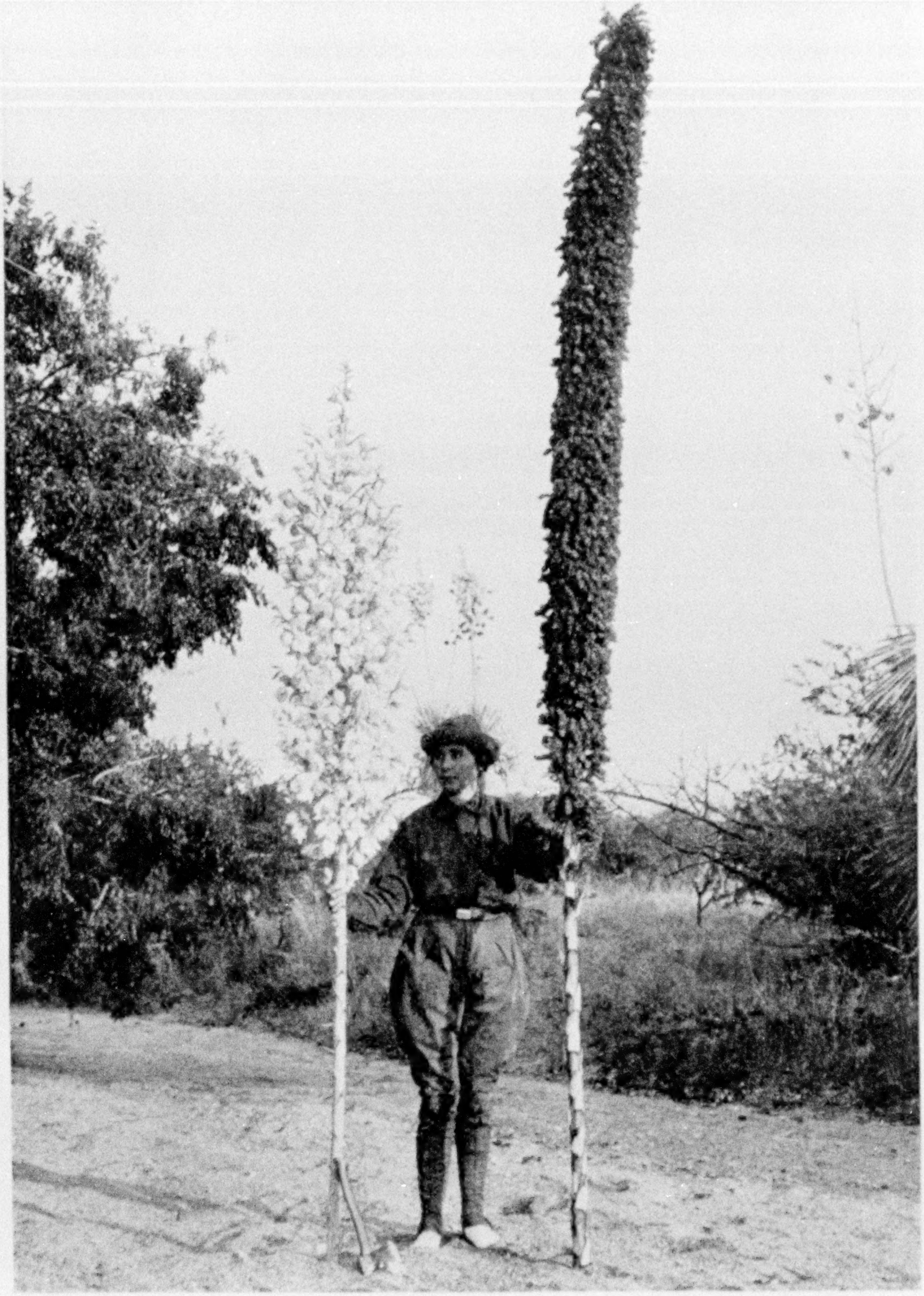
A scene in the southern Arizona desert. A Mexican with his pony and old buggy ambles along the road. The desert frequently is far from being the barren, inhospitable, drab place of popular imagination. In the spring, especially, this area abounds in flowers of many colors, which are of great interest to the botanist, and some of the plants have a high economic value.



Photograph by Frank M. Campbell

THE WHITE CHOLLA

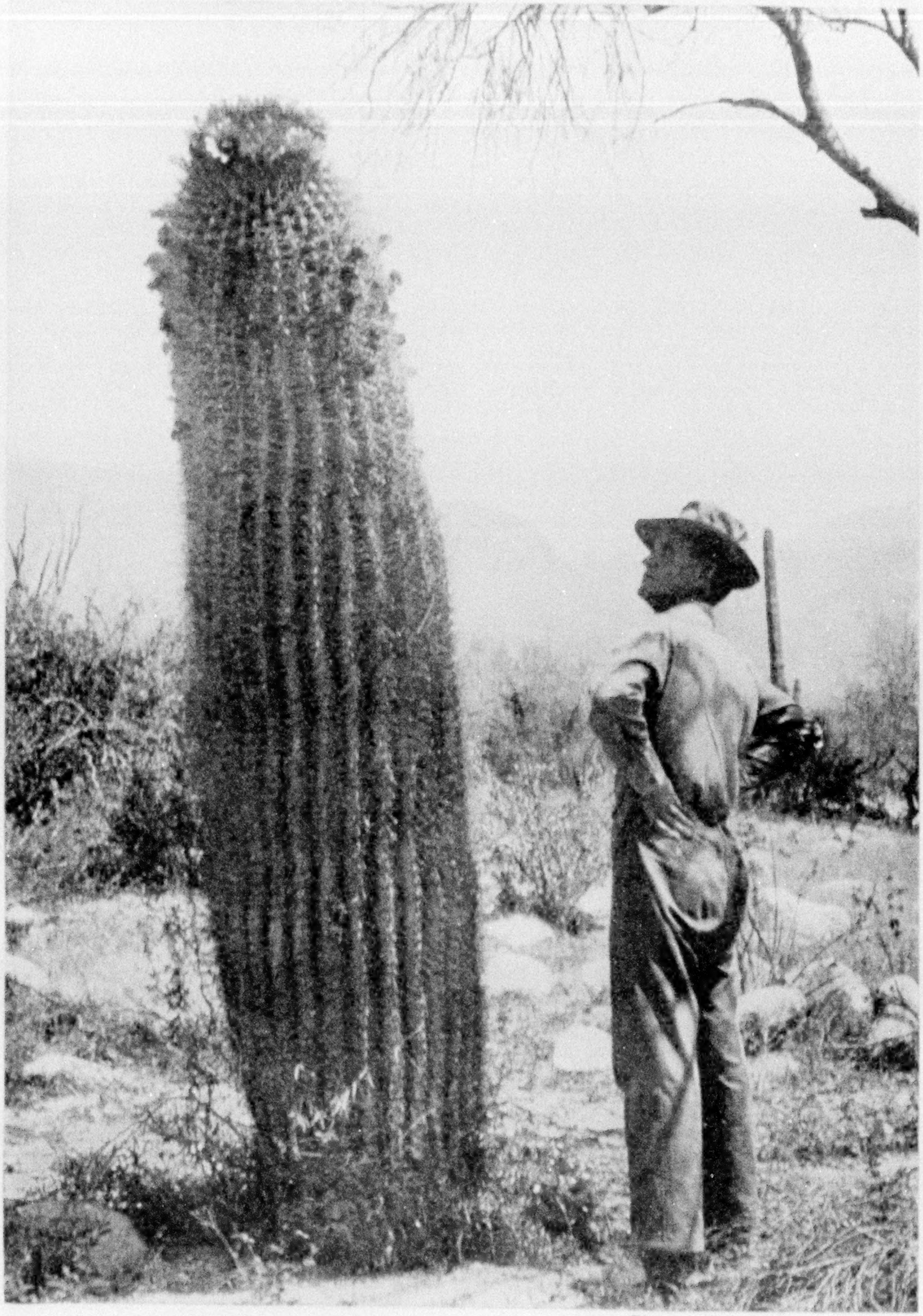
The figure of the woman gives a scale to show the height to which this plant (*Opuntia fulgida*) sometimes grows. It is common in southern Arizona and northern Sonora. The fruit, which is not edible, commonly grows in chains and persists for many years. A new fruit forms at the terminal end each year.



Photograph by Frank M. Campbell

TWO LILIES OF THE DESERT

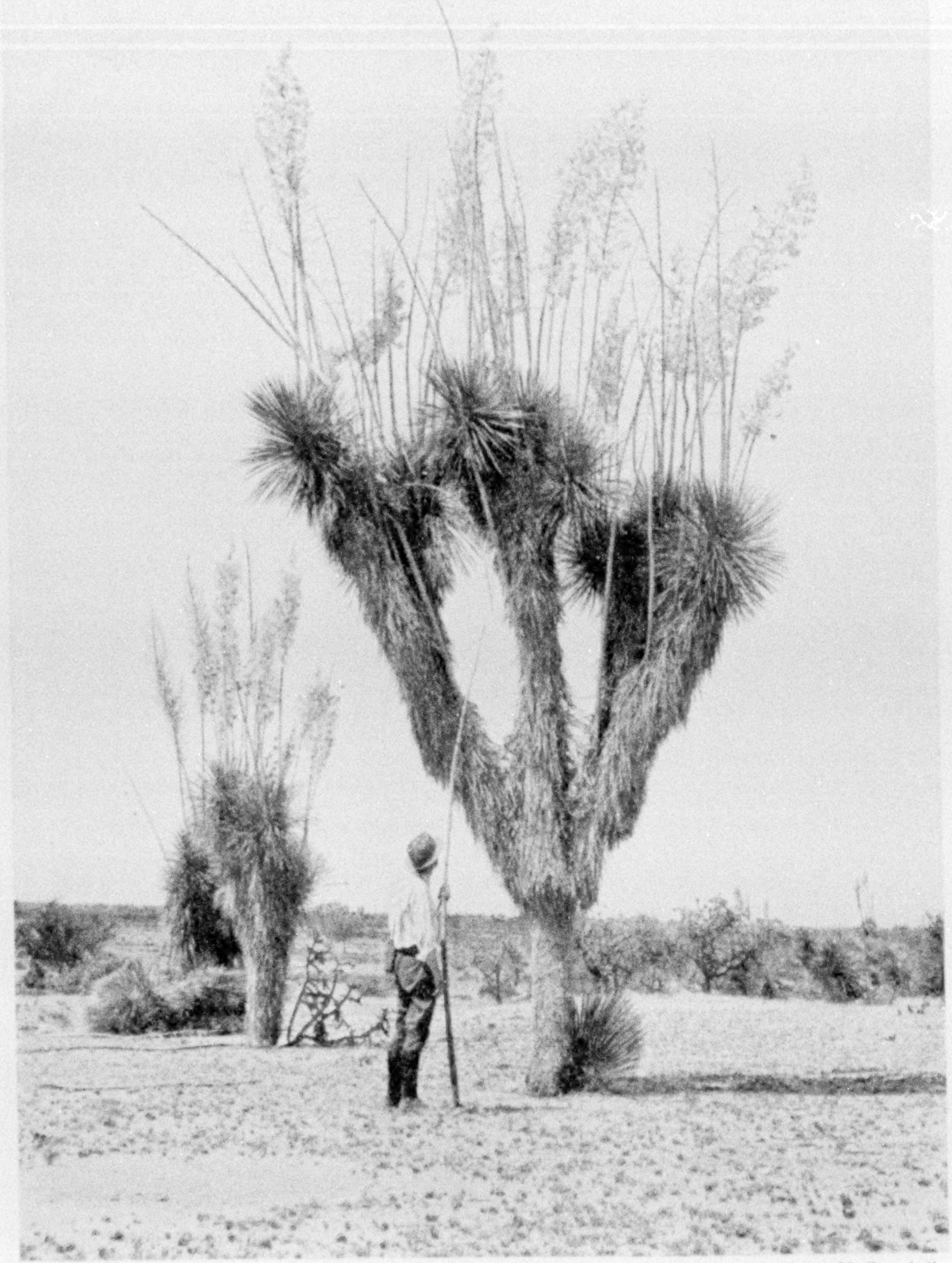
These flower clusters of the Yucca (left) (see also page 40) and the Sotol (right) (see also page 33) show the respective sizes of two excellent specimens. Both of these plants belong to the Lily family.



Photograph by Frank M. Campbell

A CACTUS THAT PROVIDES WATER

An Arizona Water Cactus (*Ferocactus wislizeni*) 7½ feet high. This species is the friend of the desert traveler, because it yields drinking water during long rainless periods. The water is squeezed from the pulp like cider from apples.



Photograph by Frank M. Campbell

A TREE LILY (*Yucca elata*) IN FULL BLOOM (SEE PAGE 38)

This plant furnishes fiber which is put to various domestic uses by the Indians of the Southwest.

# ADVENTURES AMONG THE "LOST TRIBES OF ISLAM" IN EASTERN DARFUR

## A Personal Narrative of Exploring, Mapping, and Setting Up a Government in the Anglo-Egyptian Sudan Borderland

### By Major Edward Keith-Roach

*With Illustrations from Photographs by the Author*

*The mid-Africa region of great plateaus and fertile oases which this vivid narrative describes has been visited rarely, and many curious customs of its interesting peoples are here described for the first time. The author was District Commissioner of Eastern Darfur, part of the Anglo-Egyptian Sudan, from 1916 to 1920. During that time he made excursions into various parts of his remote province and mapped areas hitherto blank on the maps. He also bears the title, "Late Bimbashi, Egyptian Army."*—The Editor.

WHEN Lord Kitchener, in 1899, had marched his victorious army, composed of British and Egyptian troops, into Khartum the reconquest of the Anglo-Egyptian Sudan was practically completed, and the work of reconstruction and administration was quickly begun. British officials were placed in charge of each province with the exception of Darfur, the most westerly province, of about 170,000 square miles, which was left entirely under the jurisdiction of its own Sultan, Ali Dinar. His only obligation was to pay a small tribute yearly to the Governor-General in Khartum.

That is the reason why I was in Darfur from 1916 to 1920.

When Turkey entered the World War she called upon all devout Moslems to join her in "the holy struggle against the infidels and dogs of Christians."

### FLAG AND SPEARHEADS WERE WAR DECLARATION

The Senussi tribe, on the western boundaries of Egypt, accepted the call and themselves attacked Egypt, which made it necessary to station a fair number of Allied troops in the oases along the frontier. They also succeeded in sending envoys with autographed letters, decorations, and jeweled swords from the Sultan of Turkey across the desert by the Arbain road, the Road of Forty Days, to Sultan Ali Dinar and persuaded him to join them in the "fight for freedom."

Ali Dinar sent off a flag and three spearheads to the nearest British official in the neighboring province as a polite intimation that he was ready to enter the lists. He then mobilized his slave army and sent skirmishing parties to molest the inhabitants of Kordofan.

These raids became so frequent and menacing that it was decided to occupy the territory, and in 1916 a small expeditionary force, consisting of Egyptian Army troops, led by British officers, and accompanied by a handful of British machine gunners, marched 400 miles along an almost waterless track. After two small battles the country was under the British flag.

The biggest engagement occurred just outside El Fasher, the capital of Darfur, in May, 1916, and the Sultan, who fled from the city as soon as the news of the reverse reached him, was killed in action in the hills six months afterward.

Unfortunately, I saw none of the fighting. After joining the Egyptian Army early in the year, I was sent to Port Sudan, on the Red Sea coast, in connection with the Arab revolt in Arabia, and it was some months before orders came that I was to proceed to Darfur and take over the administration of the eastern

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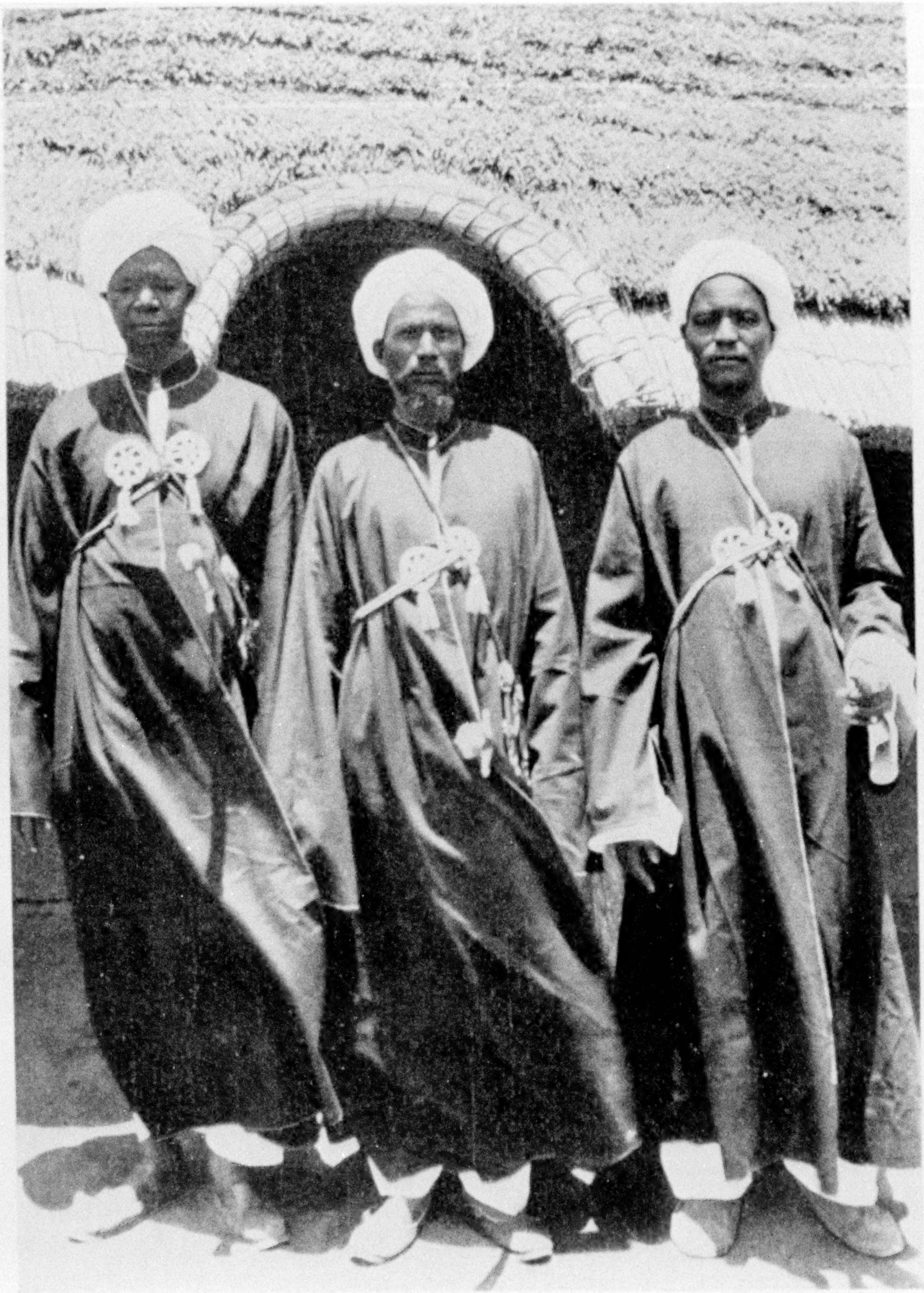


OMDAS AND SHEIKS OF DARFUR

These men have performed exceptionally good service for the state and have been awarded robes of honor by the Governor-General of the Sudan.

HOW THE UNION JACK AND THE EGYPTIAN FLAG ARE CARRIED WHEN TREKKING

district, the boundaries of which were undefined, but were roughly supposed to enclose an area of twenty to thirty thousand square miles.

### REACHES ISOLATED HEADQUARTERS

From Port Said I railed to Khartum, and after two days spent in getting provisions for my long solitude, which was to last more than three years, I took the train to El Obeid, about 350 miles southwest, where camels were purchased to carry me and my baggage some 300 miles to my future home.

Um Kedada was the name of my headquarters, and after three weeks' trekking I was told early one morning we were approaching the place; so, pushing my camel on ahead of the escort, I mounted the last sandy hill and found—a few native soldiers and a well.

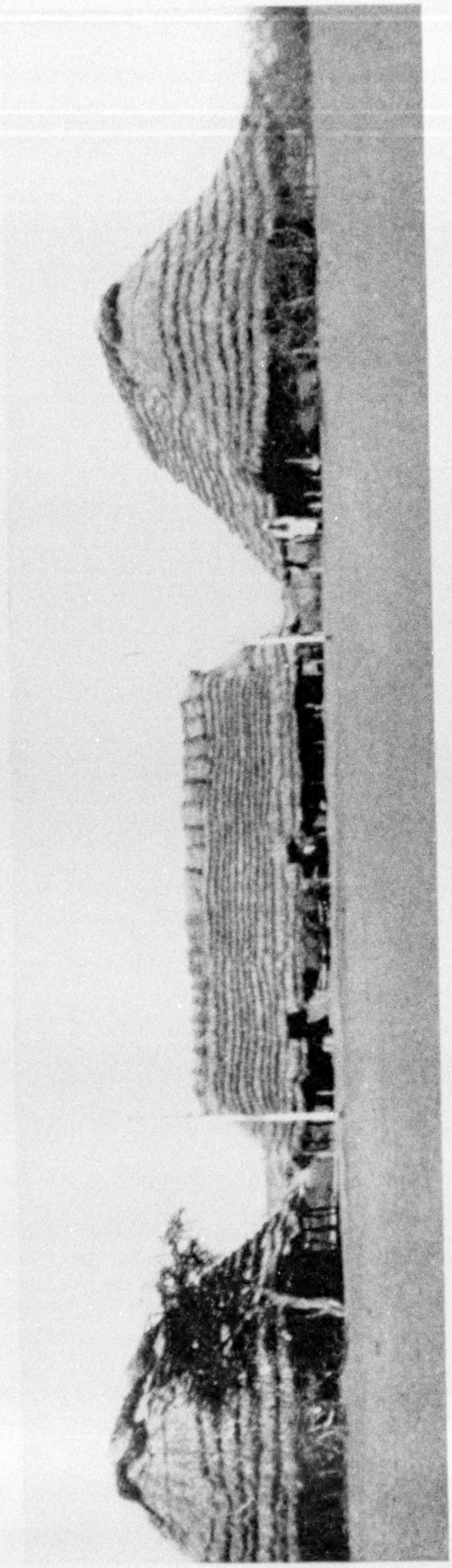
The journey was long and tiring. We marched practically all and every night except for a couple of hours at midnight to rest the camels. We tried, while the camels grazed, to sleep during the day under what shade could be found from a tree, but continually had to move the position of the camp bed as the relentless sun mounted higher in the heavens. The heat at midday varied between 110 and 120 degrees Fahrenheit in the shade, but was much more intense in the sun.

At varying intervals the track was strewn with grim relics of former camel caravans. Supercilious in life, the camel is even more so in death. Lying on his side, his upper lip drawn back, his head thrown up until it almost touches the hump, he shows by every attitude his utter contempt for the world he has left behind.

### ALONE IN THE DESERT BY NIGHT

Marching at night has a fascination all its own. My camel, being lightly laden and speedier than the others, generally outstripped them all, and I was alone in the beauty of the African night. A full moon gave light enough to read by, and a breeze from the north would blow across the sandy plains, making every blade of grass bow its rustling head. Here a cricket chirped, there a ringdove cooed to its mate, and beyond an owl hooted as he transferred his quarters from one tree to another. And so on for mile after mile, the soft pad of the camel was scarcely perceptible, even in the silence of the night.

Occasionally I passed native caravans and the courtesies of the road were



BRITISH HEADQUARTERS IN EASTERN DARFUR, CONSTRUCTED OF MILLET STRAW

exchanged: "Keif halak? Taiybin! El hamd el Allah. Maa-salaamih." (How are you? Well! Praise be to God. Go with safety.) Ghostly voices coming out of the night!

Early in the small hours the moon disappeared, leaving momentarily a red glow in a haze of palest lilac. For the next hour or so, there being no competitor, the stars shone with renewed splendor on the darkened world, and once or twice a meteor shot half across the heavens, leaving a trail of fire. Toward 6 o'clock the east was flooded by palest rose pink, and a few minutes later the sun was up. The spell was over, life became real again, and I instinctively felt for my helmet and looked round for a place to camp.

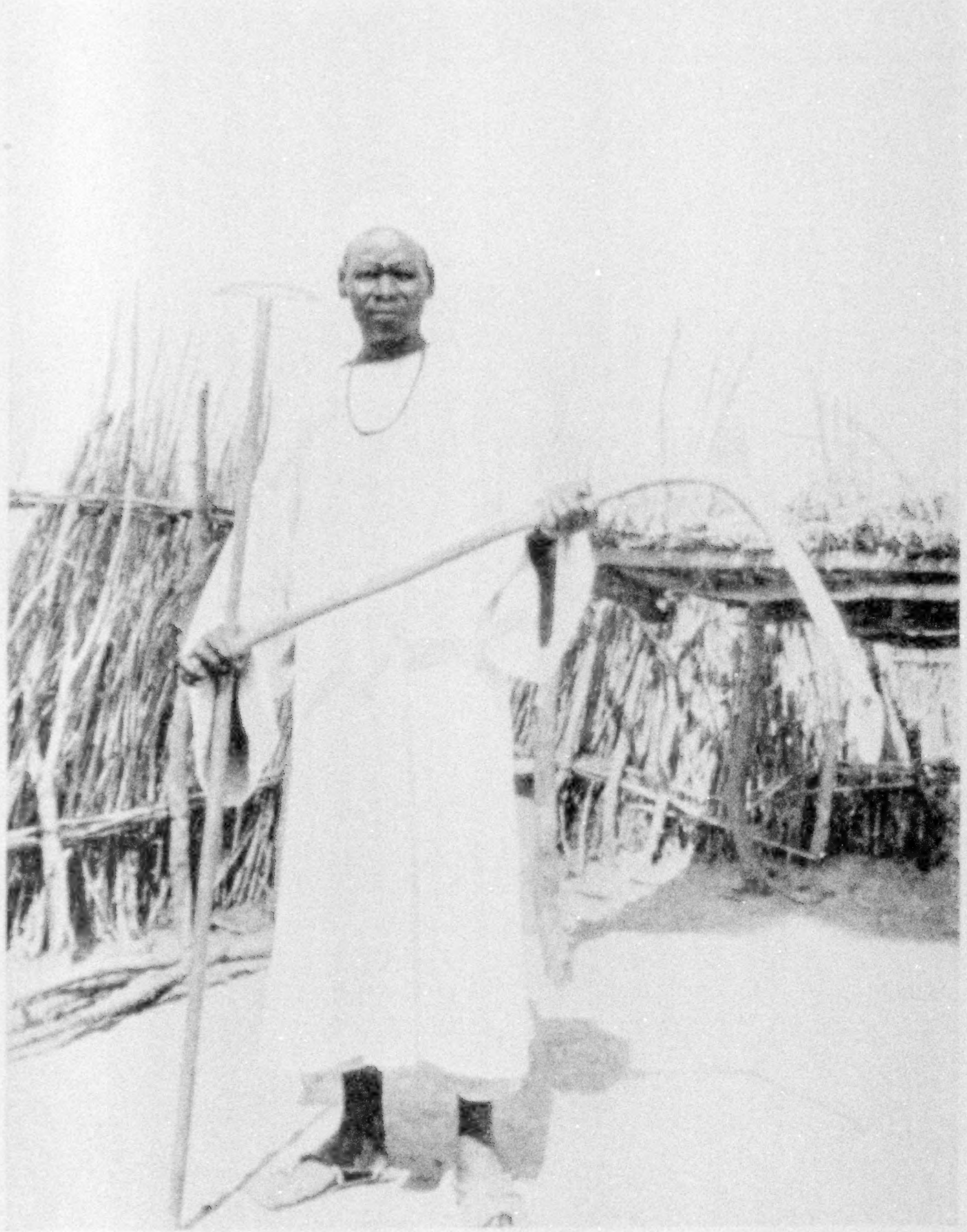
### BUILDING IN TOPSY-TURVY LAND

Um Kedada, which was a military base for our army on the march up to El Fasher early in the year, stands on high ground with a fair outlook, surrounded by escarpments of low-lying hills. Its chief call to fame is a most excellent water supply—an invaluable asset! The well, broad and fairly deep, is lined with rough stone halfway down, and was dug many years ago at the instigation of an old sultan, who made a chain of wells leading into Kordofan to assist his raiding parties, which periodically sallied forth after his neighbors' cattle. The old method of lining is now, alas, a lost art among these people.

It is difficult adequately to picture what a well means until one has lived near the Sahara. In my 300 miles I passed two places only where there were any, and on my arrival at Um Kedada I had been for six days subsisting on what water I could carry on my camels; they had been all that time without a drink.

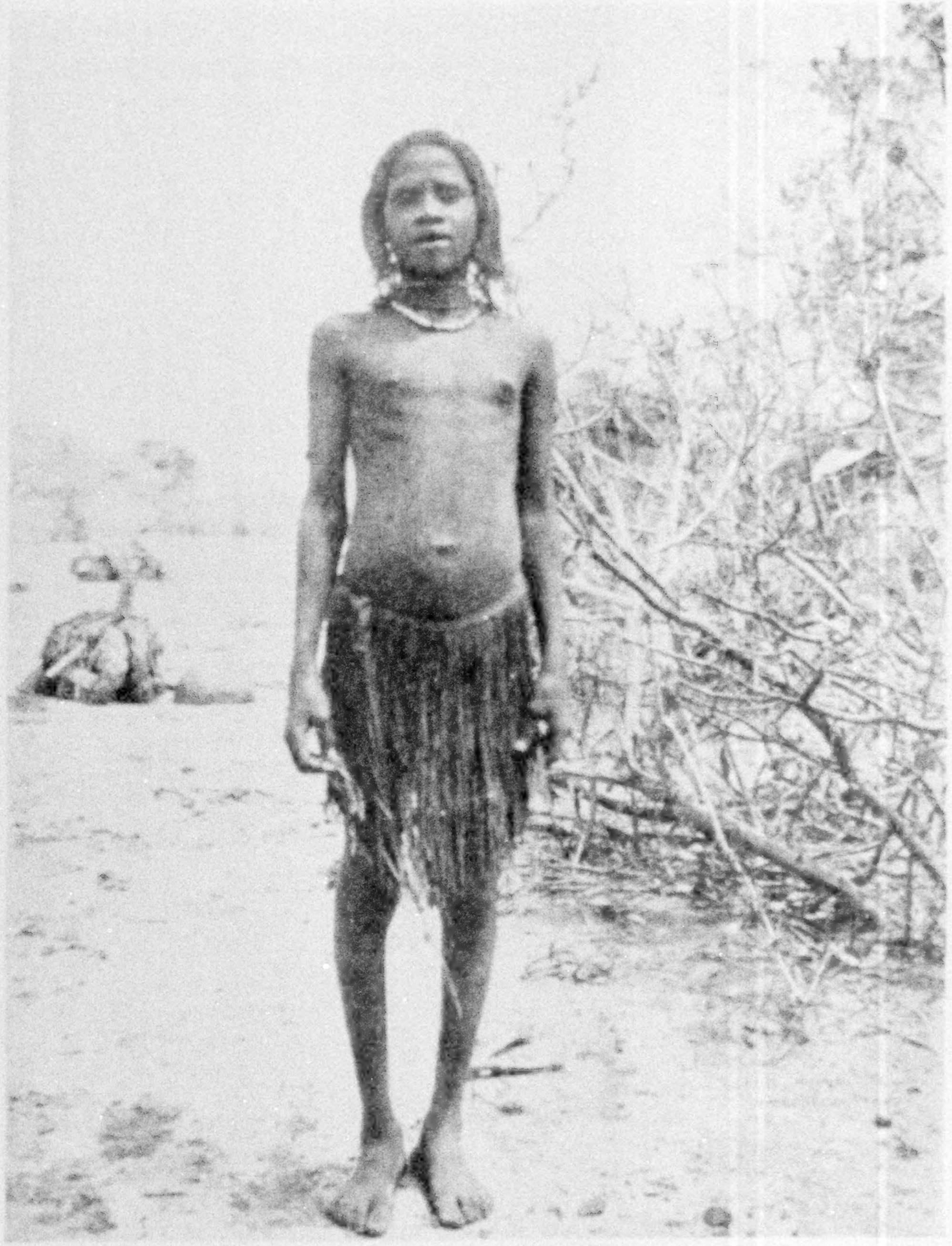
Greetings made to all assembled at the well, animals watered, and men rested, I looked round for a convenient place to build a temporary house.

In a land of opposites, where one writes from right to left, takes off one's shoes and leaves the hat on when entering a house, we naturally begin building at the roof and build downward. Native *tukls*, or huts, are made from dried millet stalks and are shaped like straw beehives, but are finished at the top with little tufts,



AGRICULTURAL IMPLEMENTS USED IN DARFUR

The half-moon shaped hoe is used in weeding millet; the other implement is a branch of a tree, bent at right angles, used in planting the grain (see page 61).



THE "KAHAD" IS THE FASHIONABLE ATTIRE FOR DARFUR GIRLS

This garment consists of strings of leather hanging from a belt. Boys wear a sacklike shirt of rough cotton cloth, with holes for their arms (see text, page 58).

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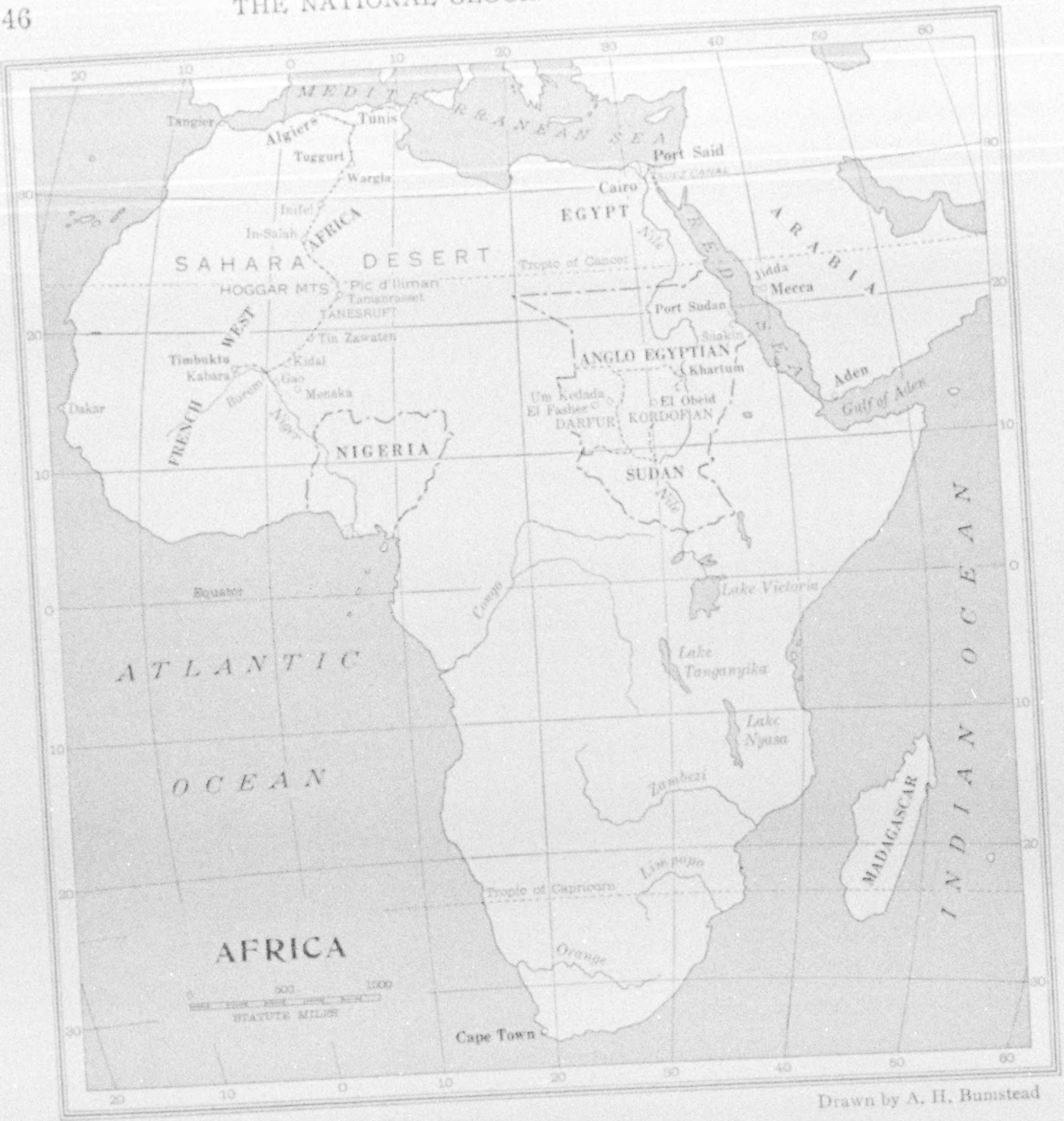
MEDITERRANEAN SEA
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AFRICA
SAHARA DESERT
Tropic of Cancer
HOGGAR MTS
Pic d'Iliman
Tamanrasset
TANESRUFT
Tin Zawaten
WEST
Timbuktu
Kabara
Kidal
Gao
Menaka
Bourem
Niger
FRENCH
Dakar
NIGERIA
ARABIA
RED SEA
Jidda
Mecca
Port Sudan
Suakin
ANGLO EGYPTIAN
Khartum
Um Kedada
El Fasher
DARFUR
El Obeid
KORDOFAN
SUDAN
Aden
Gulf of Aden
Equator
Congo
Lake Victoria
Lake Tanganyika
Lake Nyasa
ATLANTIC OCEAN
INDIAN OCEAN
Zambezi
MADAGASCAR
Limpopo
Tropic of Capricorn
Orange
Cape Town
AFRICA
0 500 1000
STATUTE MILES

Drawn by A. H. Bumstead

A SKETCH MAP OF AFRICA SHOWING DARFUR

They look for all the world like wooden whip tops upside down.

Eight long branches are placed with ends on the ground, tied together in the center, and laced round with smaller branches until the structure looks like an army bell tent. This is the roof, which is then thatched with millet straw from the bottom upward and tied together tightly at the top into the little tuft.

This superstructure is then raised up on poles set in a circle with a V at the top, standing about four feet out of the ground. The sides are then thatched and the palace is ready for occupancy. Doors and windows are a trouble, owing to the constant wind that blows in the sand at all times of the day and night; so windows are dispensed with, and a kind of hurdle, placed on the windward side, serves for a door.

A cavalcade of horse, infantry, and camel men, led by two British officers, bronzed and burnt by months of trekking, filed slowly through Um Kedada on its long journey from El Fasher to Khartum.

As the eye traveled from end to end of the long brown line, it was arrested by a wonderful blaze of color in the center of the column.

A SHEIK AND HIS HORSE DECKED OUT IN GALA ATTIRE

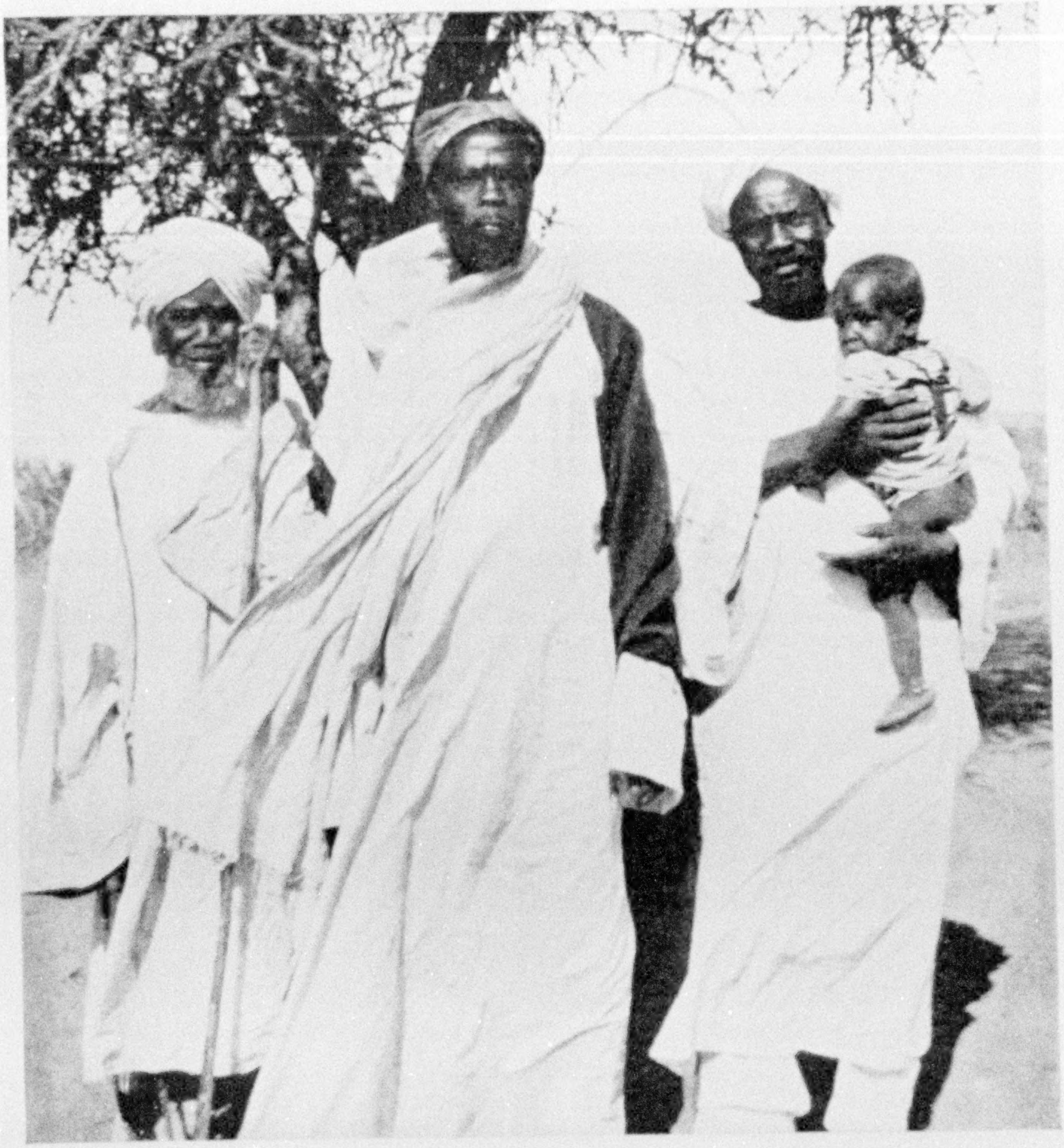
There were some twenty men mounted on camels, and their gorgeous dresses scintillated in the rays of the western sun.

Here a purple *djibbah* (cloak), there a strawberry-colored one, a bright yellow one farther back, but at the head of all was an imposing figure in green and gold with a colored turban. Who were these men? What were they doing between the ranks of the Arab soldiers?

### A CRIPPLED REMNANT OF SULTAN'S RULE

They were the legitimate sons of the late Sultan Ali Dinar, and the figure at their head was Zakariah, the eldest son, who but for his father's misrule might have been sultan after him. As one watched the imposing cavalcade go by, a twinge of sadness crept round one's heart; another native-ruled state had ceased to exist, and one felt a lurking sympathy for the eldest son, leaving his father's kingdom. But the feeling was checked by hearing the wheezing of a native near by. Every breath he took appeared to be almost his last; his chest was emaciated and seemed driven into his back. This was his tale:

"Two years ago the Sultan stopped here for a few days, and I, among others,



FOUR GENERATIONS OF MEN OF DARFUR

was told off to guard Ali Dinar's camels. One of them unfortunately broke its hobbles, strayed away, and could not be found at the moment of departure. The Sultan ordered me before him and his son Zakariah, and had me beaten with a heavy pole—back, chest and legs."

Two years after, by my side stood the victim—a hopeless invalid for life.

A son had lost his inheritance, but a people were delivered from bondage.

The army's work in Eastern Darfur being completed, the small detachment of Sudanese soldiers left for other fields.

To bring them good luck, thirty piasters, about $1.50, were donated by Europe's only representative to purchase a sheep.

As the order to march was given, the "lucky" animal was dragged into the gateway of the *zereba*, a knife flashed out, the jugular vein was severed, and the men, from column of fours formed two deep, then single-filed, and each stepped carefully, happily, proudly, over the dying, pulsating body. A job well done, the men stood ready to bring honor to their regiment in other theaters of action, or else to dwell awhile with their families and recount their deeds of 1916.

Martial law had ceased; civil administration reigned in its stead.

FROM LEFT TO RIGHT, MOTHER, DAUGHTER, GRANDMOTHER, AND GREAT-GRANDMOTHER IN DARFUR

Our temporary dwelling finished, the work of creating a town started in earnest.

### TOWN PLANNING IN NOMAD REGION

This was planned in lots of 197 by 197 feet, with roads running north to south and east to west, of 65 feet and 32 feet, alternately. On each of these plots nine tukls were allowed to be built, and a man was appointed head of the plot to see that it was kept in a sanitary condition. Natives gradually collected from the surrounding hamlets to be near the well, and a town of 500 or 600 people soon sprang up, including a few pilgrims from Nigeria, about whom I shall say more later. People did not formerly live near the highway for fear of being raided by passing bands.

Two native builders of more or less doubtful value came up from Kordofan Province, and we opened up a new industry—brick-making.

Our methods were somewhat crude, but the result was a fairly solid brick that proved an advance on millet straw. Sandy clay mixed with water was put into a mold made from old provision boxes, and the bricks were turned out and dried in the sun.

Meanwhile foundations were dug for the offices, stores, a prison, and official houses.

Lime and cement were not procurable, so mud was used for plaster and proved an effective substitute.

A wanderer arrived who had a slight knowledge of carpentering, so he was drawn into the mesh and, with the help of primitive tools, produced presentable doors and windows from forest wood and old packing cases.

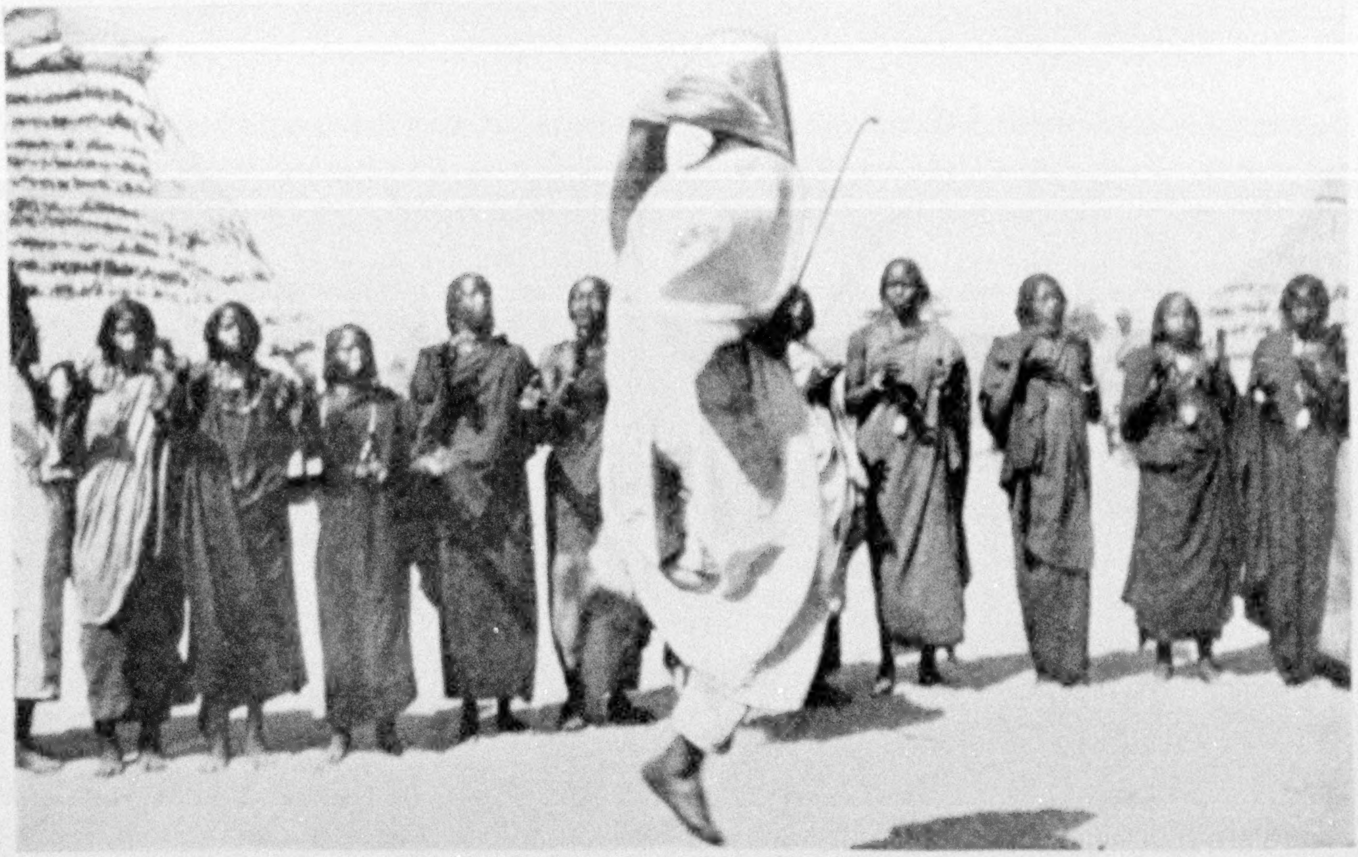
Timber for the roof had to be brought up many miles on camel-back, as nothing long enough grew in the vicinity.

Old rifle barrels were used as bars for the prison windows and proved most serviceable.

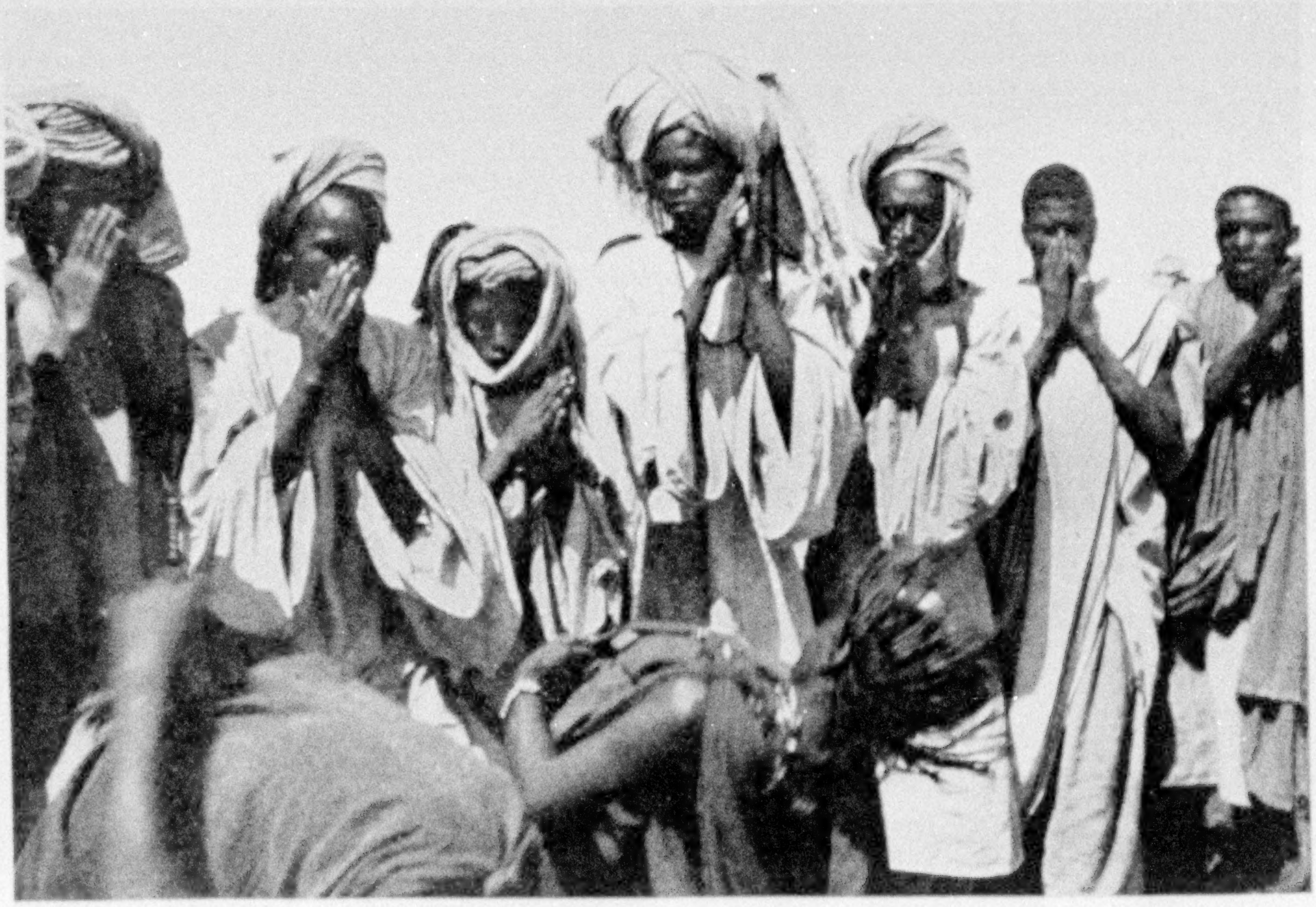
### A SHEIK AND HIS FAMILY HEIRLOOM

With the buildings half up, a heavy tropical rainstorm, entirely out of season, did much damage, but eventually all was successfully accomplished.

One morning four camels, groaning

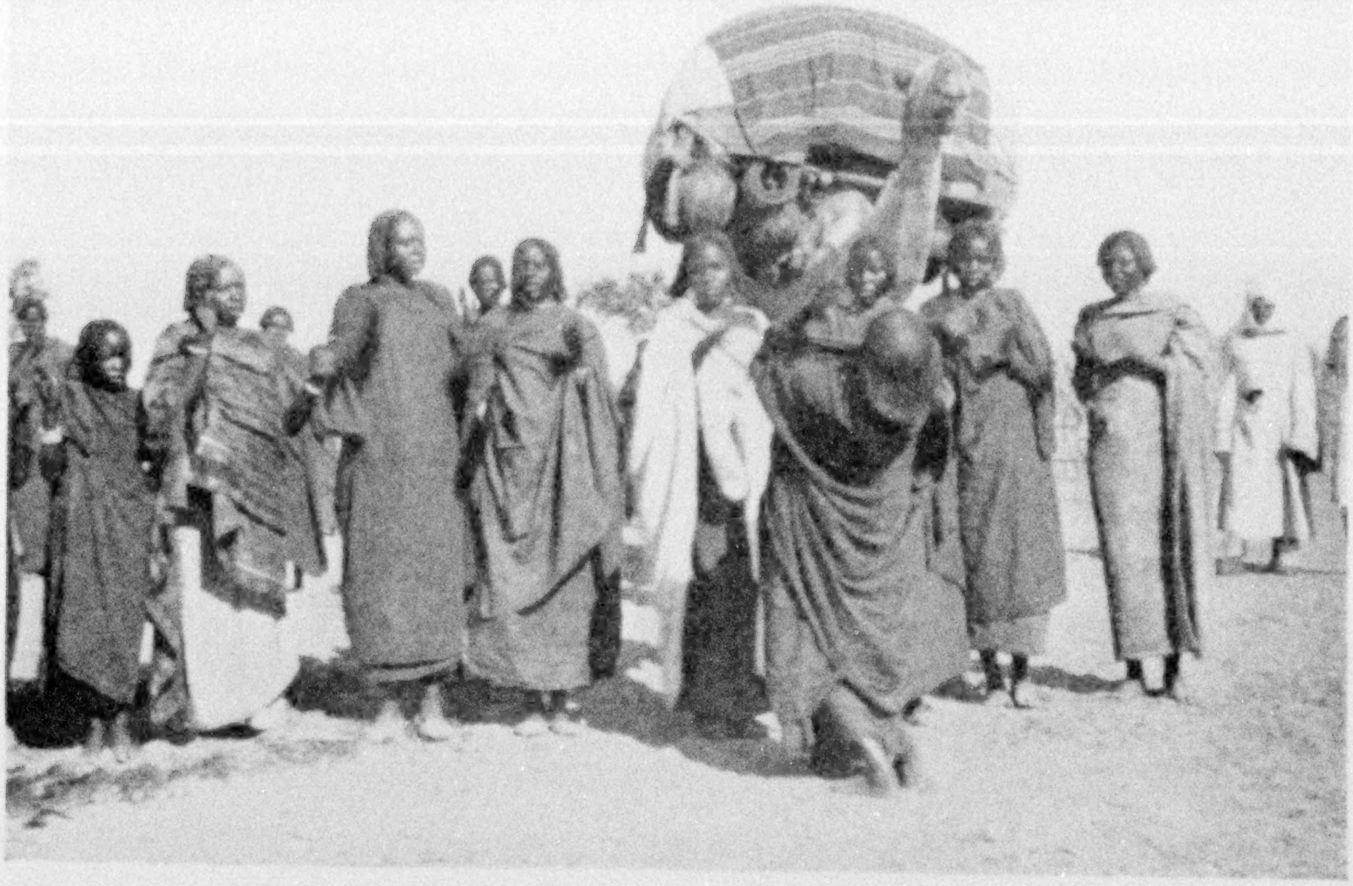


A DANCING DERVISH OF DARFUR

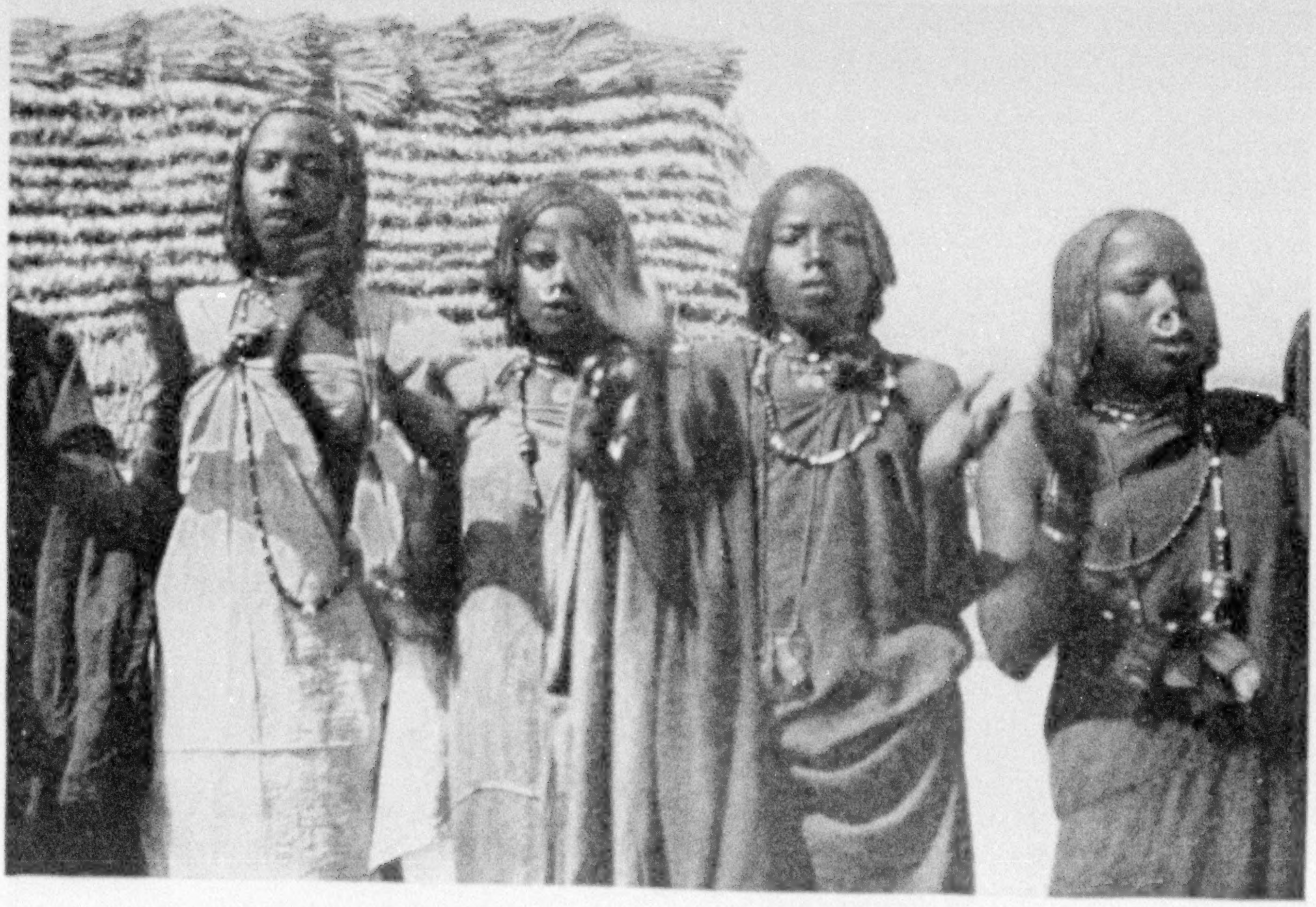


ENTERTAINING AN OFFICIAL GUEST

There was always a dance when the District Commissioner visited a village. The star of this performance is a girl who bends backward until her forehead touches the ground.

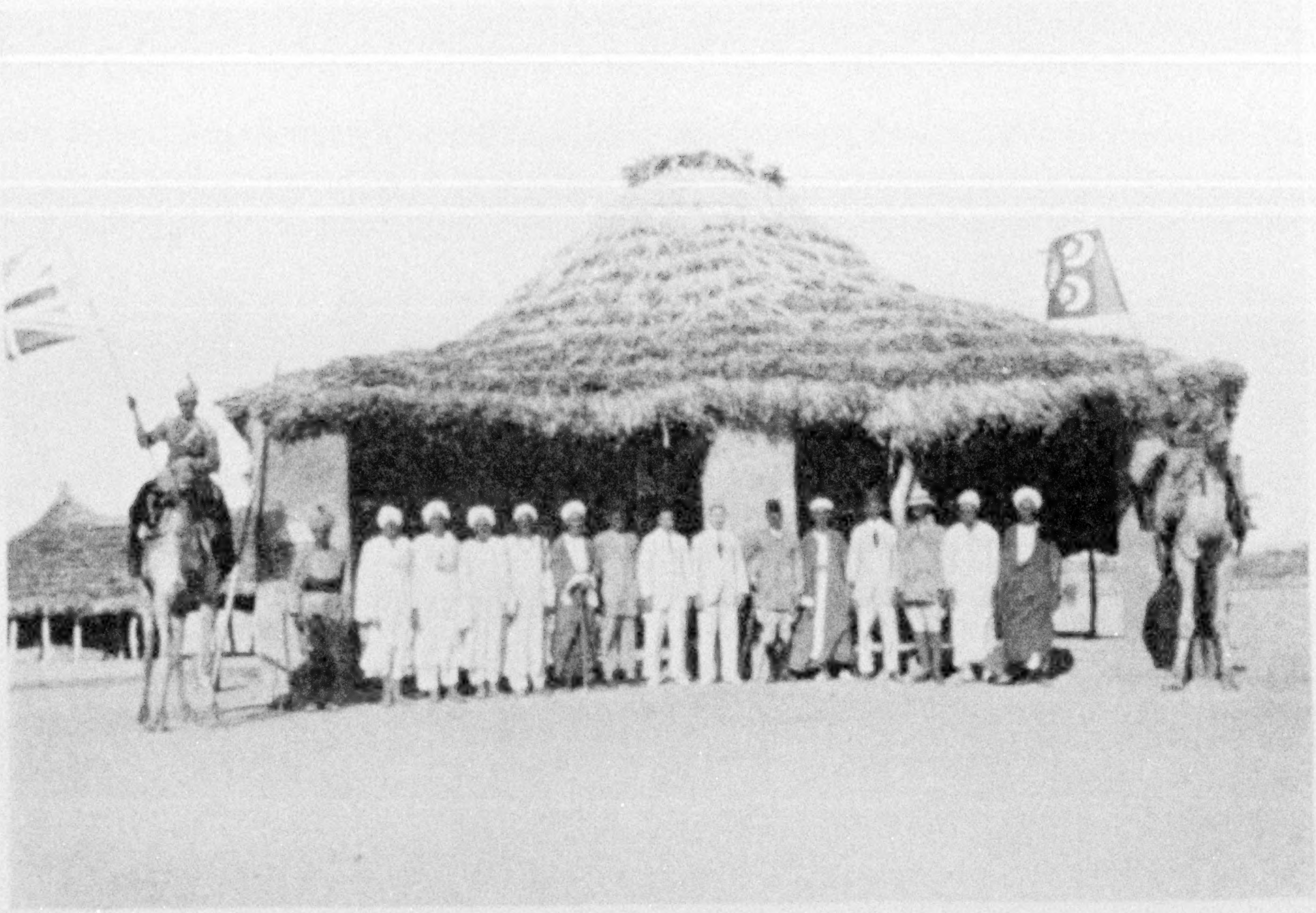


DANCING BEFORE A BRIDE

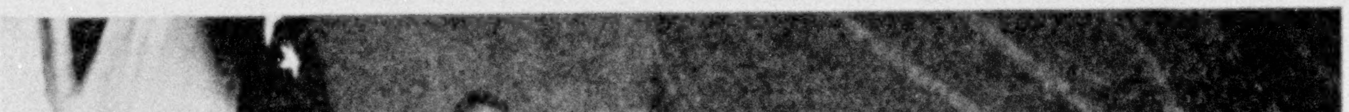


ORCHESTRA AND CHORUS FURNISHING ACCOMPANIMENT FOR A NATIVE DANCE

The men stand together in a row clapping their hands and humming in deep tones (see preceding page), while the girls stand opposite singing.



THE OFFICE STAFF AND NATIVE NOTABLES WAITING OUTSIDE THE AUTHOR'S HOUSE TO ATTEND A RECEPTION: DARFUR



HOLDING A NATIVE RECEPTION

In this instance the author is the host. The way in which the headman of a village receives an official visit is described on page 69.

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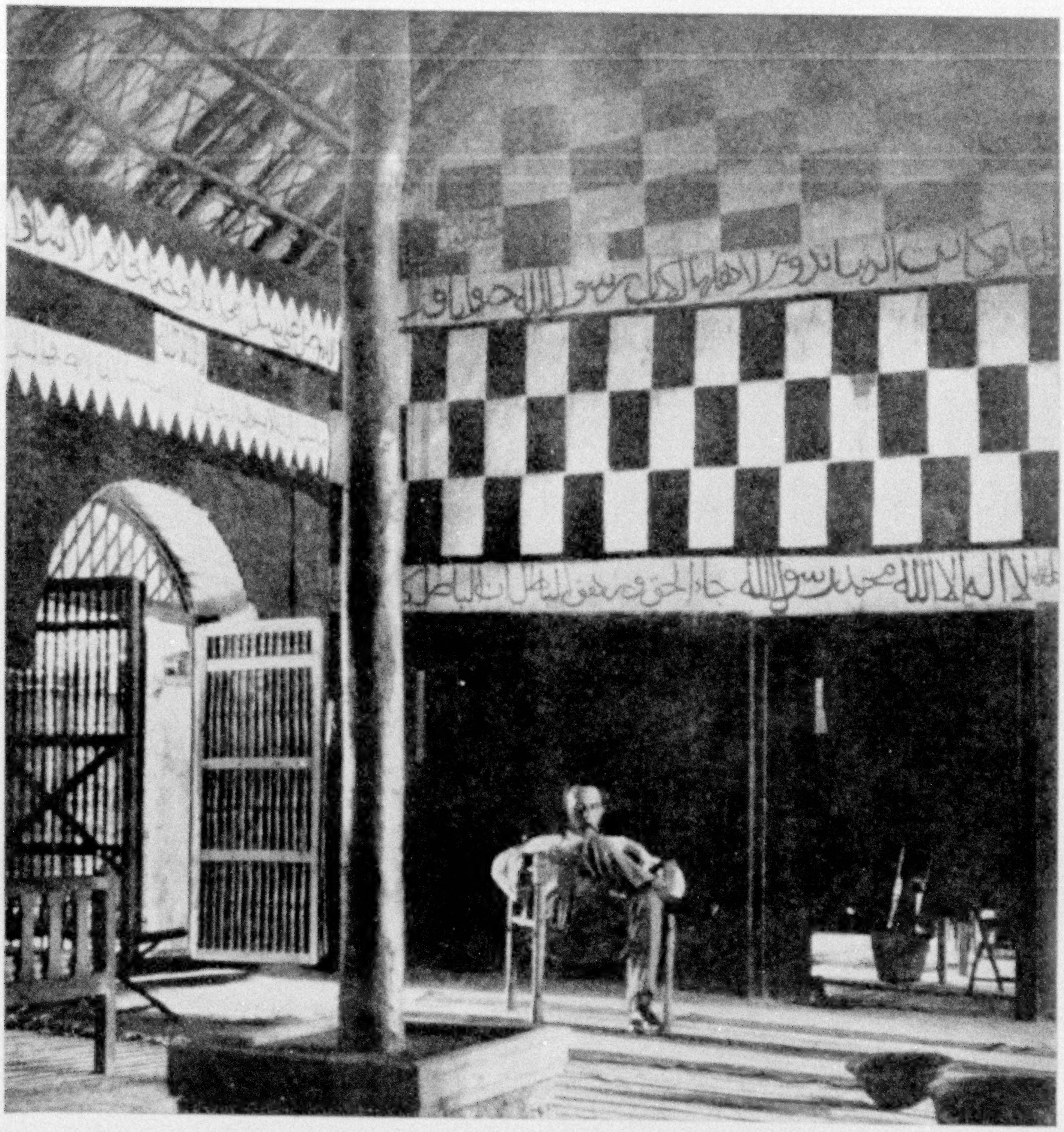


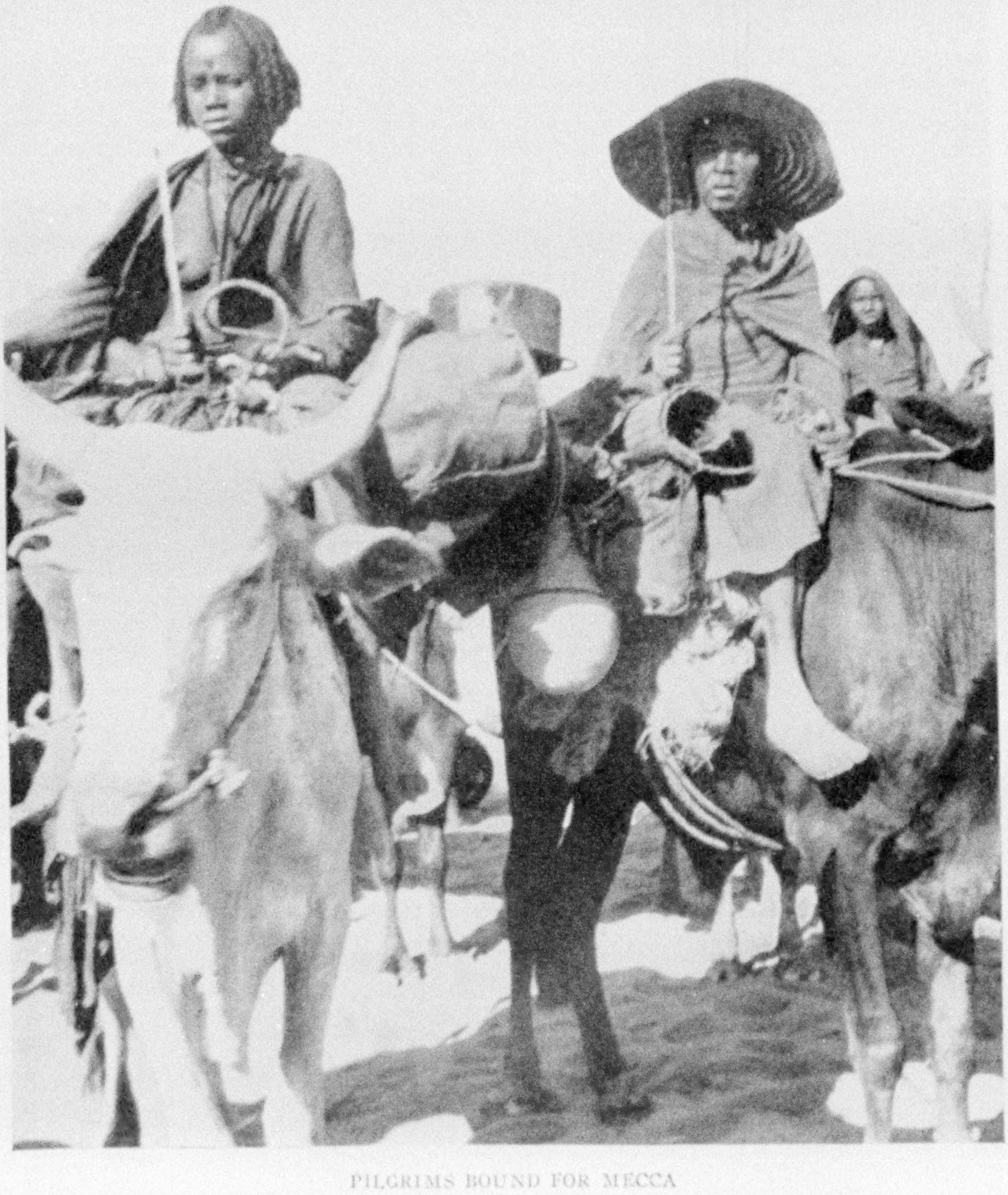
THE HAREM OF SULTAN ALI DINAR'S PALACE AT EL FASHER, THE CAPITAL OF DARFUR

The verses from the Koran which decorate the walls may be freely translated thus: (*Top right:*) "Should the world remain eternal to its creatures, the Apostle of God would have remained alive and existing." (*Bottom right:*) "There is no God but God. Mohammed is the Apostle of God. Right has been established and vanities have vanished, for they are things that pass away." (*Left:*) "Oh God, cast your prayers upon Mohammed at the beginning and at the end; the first and last of the prophets and apostles. There is no God but God." This palace was built by a Greek who was a prisoner of the Sultan for many years.

and protesting, announced the arrival of the office fittings sent from Khartum. Their loads were dumped down, and the gentlemen in charge, relieved of their responsibility, went off to a tree conveniently near and, under its kindly shade, discussed the three really important questions in their lives—money, drink, and women.

Undismayed by the fragments of their conversation which floated across, I struggled off in the deep sand to urge the sheik who was building the office to greater efforts. Within two days the walls were finished. This sheik was a worthy soul, and the end of the rosary which he wore round his neck was adorned with a fragment of an ancient wire hair comb—a family heirloom!

The first crate produced those indispensable articles of furniture so well known in concert-rooms—four bentwood,



PILGRIMS BOUND FOR MECCA

Two years or more are frequently required for the overland journey from Nigeria to the great holy city of Islam, and along the route the travelers find it necessary to bide awhile from time to time to earn sufficient funds to pursue the pilgrimage.

DARFUR LIES ACROSS THE LINE OF MARCH OF NIGERIANS BOUND FOR MECCA

In the days of the late Sultan Ali Dinar, heavy toll was exacted from such travelers. Frequently the fairest daughters of a party were seized for the tyrannical ruler's harem.

cane-seated chairs. They had such a touch of "special terms for schools and large parties" that one welcomed them with open arms.

But, alas, they were in pieces!

Vigilant search through the case revealed eight nuts and bolts and sixteen screws, but no spanner and no screwdriver. However, the bolts were driven home and the nuts screwed on by finger-power. The screws defied all attempts with pocketknife, coin, and piece of tin, when suddenly one of the helpers had a bright idea and, rushing off to his donkey, cut off a charm hanging round its neck and produced—the business end of a screwdriver! It was small, rusty, and blunt, but I doubt if ever an artisan cherished the finest instrument in his toolbox as much as I did this veritable gift from Allah. A handle was soon made, and so efficacious was the tool that the last chair was put together in eleven minutes.

### WHERE SHEIKS ARE MAYORS AND OMDAS ARE GOVERNORS

The official in charge of Eastern Darfur has to be administrator, magistrate, collector of revenue, estimator of crops for tithes, commandant of police, veterinary surgeon, surveyor, doctor, and all the other things that go to make up a well-ordered community. Consequently many months were spent in setting up the system of organization. Sheiks were appointed in charge of villages, and *Omdas* placed in authority over groups of villages and given limited powers, sufficient to enforce their orders. Police had to be recruited and trained. Roads had to be cut through the scrub or tracks widened. All this entailed many weeks' touring by camel from place to place.

Villages were few and far between, there being only about 300 in the whole district, containing about 30 to 200 people each.

The country is mostly bushy scrub and covered with a grass called *haskaneet,* the seeds of which have innumerable little spikes that get into everything—food, clothes, hair, and skin—setting up nasty irritations. The natives all carry home-made tweezers to extract the spikes from their legs. This grass springs up during the rains, and a month afterward is burned brown, when the seed pods start flying about.

The sand on the tracks is very heavy and frequently, if walking, one sinks in over the ankles.

Millet is the only species of grain that

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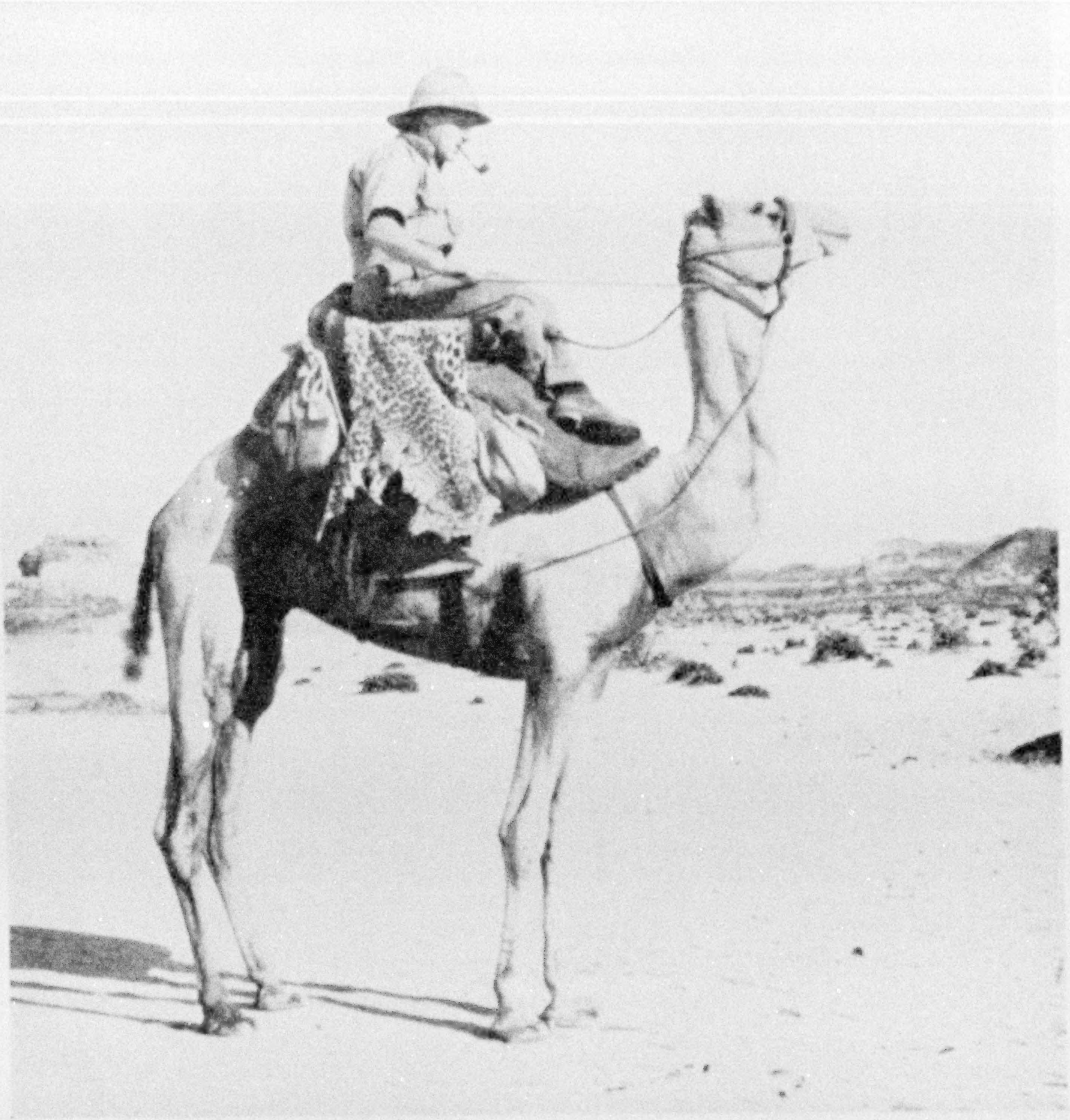

READY FOR AN INSPECTION TOUR IN DARFUR

It was a journey of 300 miles by camel transport from El Obeid, 350 miles southwest of Khartum, to the author's headquarters for the administration of Eastern Darfur, in which province, on the Anglo-Egyptian Sudan border, he remained for more than three years.

will grow in the district, owing to the poorness of the sand as soil.

I generally trekked fifteen days a month, but one long tour took me over two months. At harvest time I frequently rode enormous distances on my camels to pay surprise visits to estimators who were assessing the crops for revenue purposes.

### OFFICIAL ALSO IS "MEDICINE MAN"

I took a medicine chest with me and was called upon to prescribe for every conceivable ailment, from helping a woman who could not feed her baby to restoring an old sheik's youth; from setting a broken leg to casting out a devil from an old woman who was reported to bark like a dog. As the barker refused to yield to treatment, I lighted a fire of damp straw under her bed with most happy results, and my fame as a medicine man spread far and wide.

Serious crime is extremely uncommon, and the people have such a sense of justice that I could send a verbal order accompanied by an impression of my seal—

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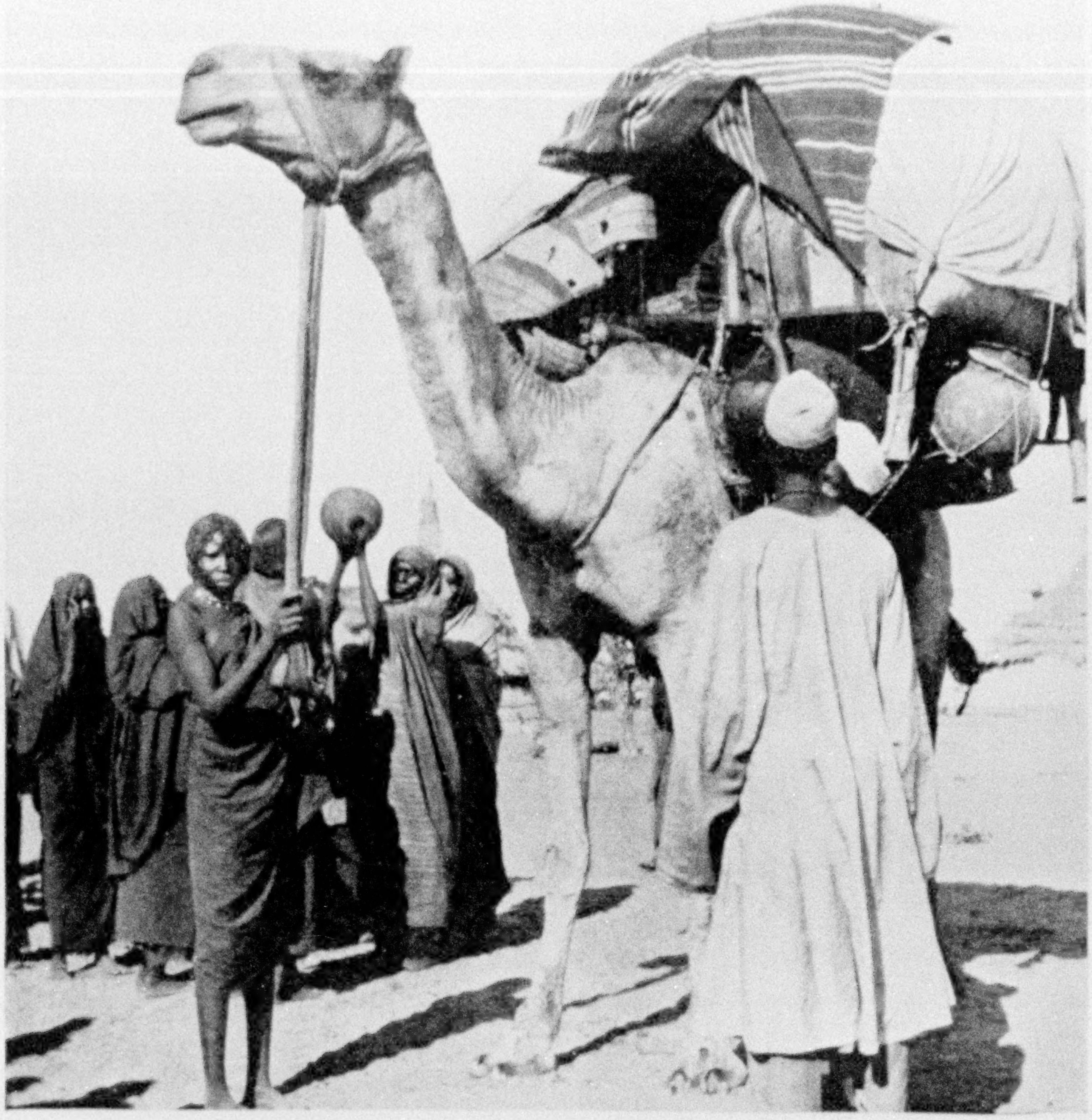


HOW A LADY OF QUALITY TRAVELS IN DARFUR

Her bed is slung across the camel and a shelter made from the sun. In this instance the traveler is a bride going off to her husband's village.

few can read or write—a hundred miles away, visit the place six months afterward, and find it faithfully obeyed.

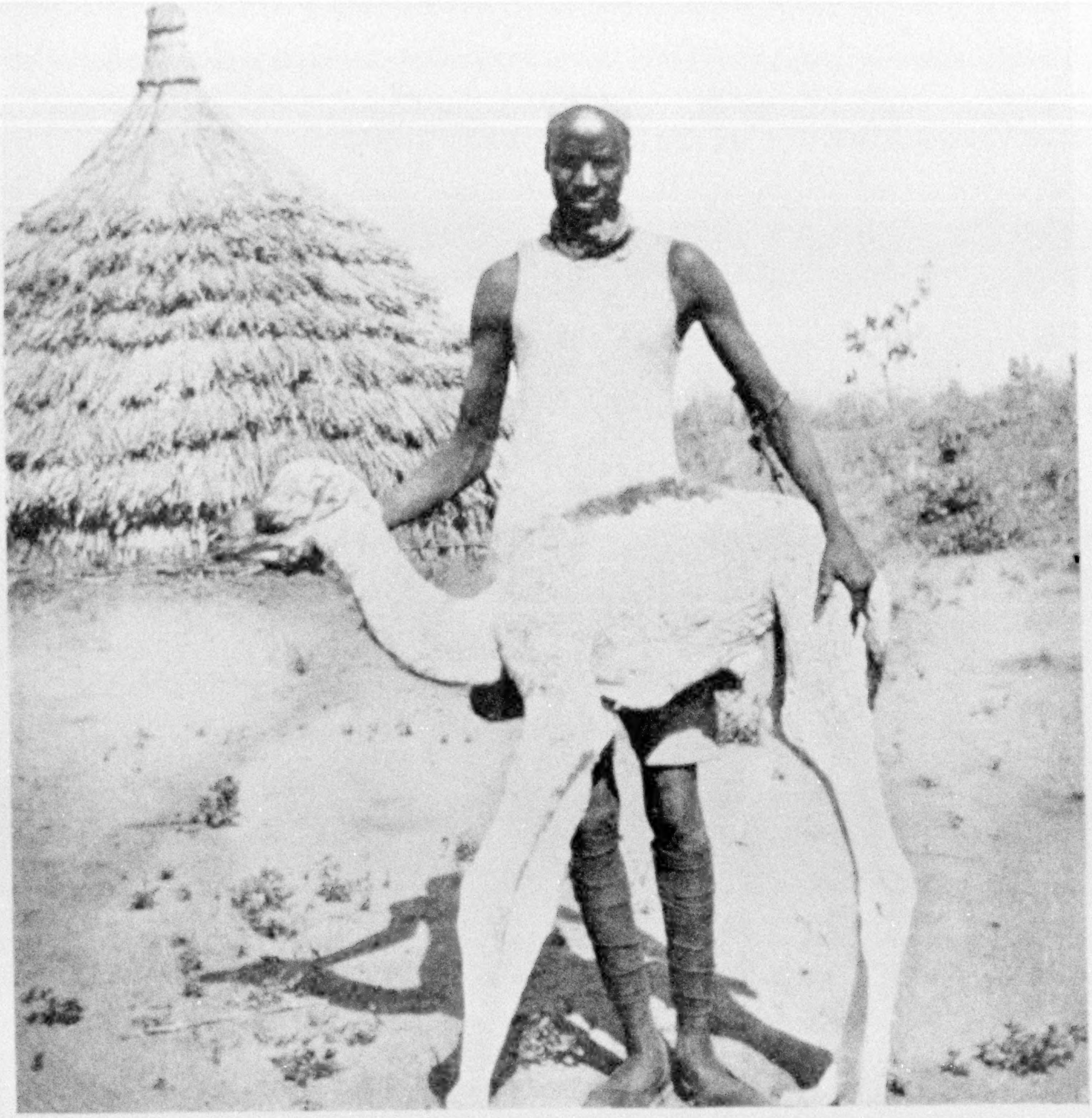
Practically the whole of the district was unmapped, and so when I traveled by day a man pushed a cyclometer in front while I took bearings with a prismatic compass, checking the distance traveled by the cyclometer, and plotted it on map paper while I camped at midday (see illustration, page 61).

Although the inhabitants call themselves Arabs and speak that language, they are negroids—that is, negroes with a small admixture of Arab blood which has come down through the ages.

They are Mohammedans, but as few can read or write, they are not strict followers of the Prophet, except in that both sexes respect the Ramadan, the month of fasting.

### MOTHER'S BACK IS CARRIAGE AND CRADLE

The children attract attention. The babies are carried on the mothers' backs. A child is caught by the wrist and adroitly swung around to the mother's back, a leg on either side of her waist, and



A CAMEL CALF TWO DAYS OLD

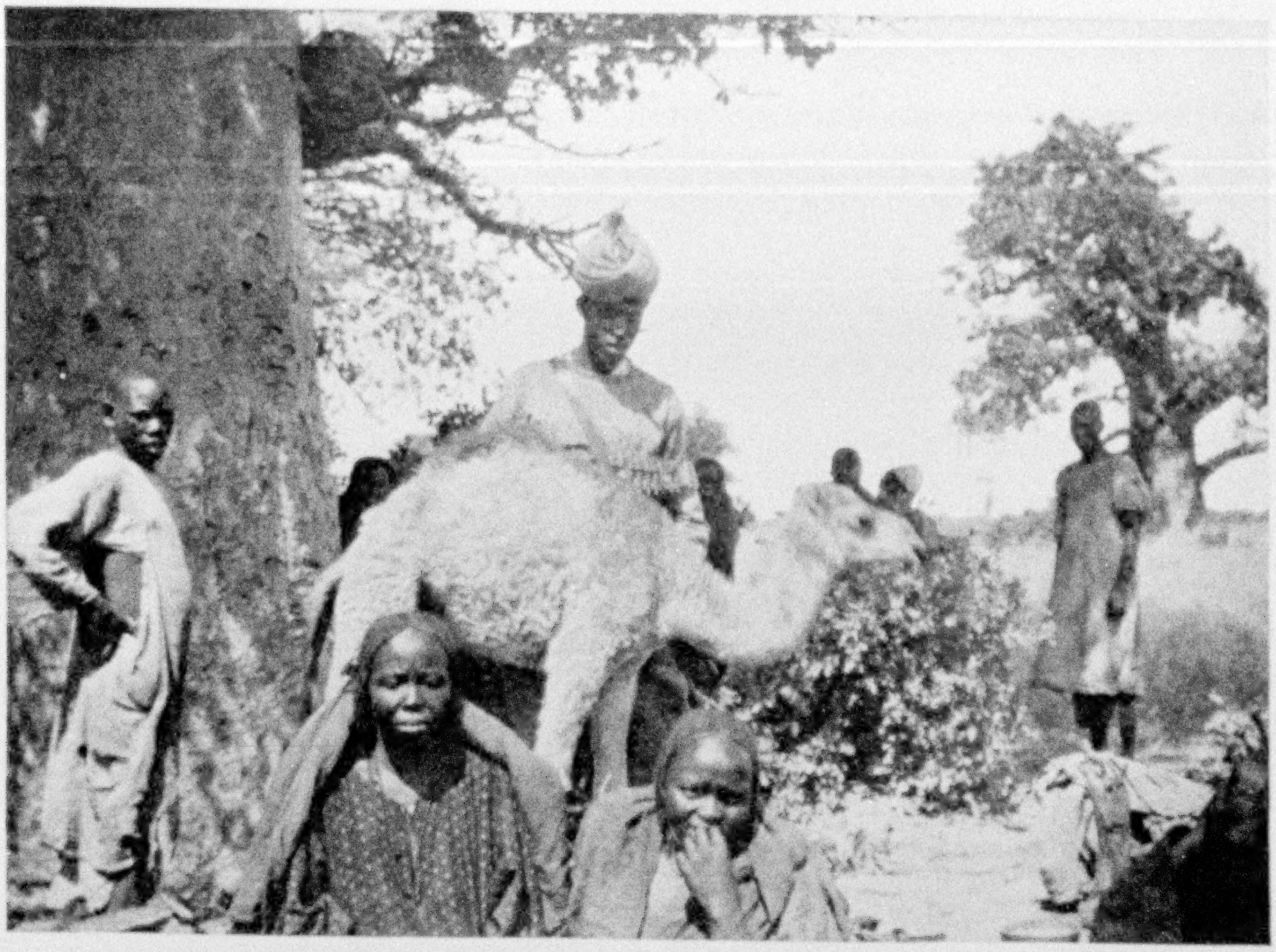
While the Arabian camel stands three feet high a few days after birth, it does not reach its full growth until its sixteenth or seventeenth year, and it lives from 40 to 50 years.

is tied by a piece of her raiment, with its arms inside. There the infant stays for hours, with its little head sticking out, looking wonderingly at the world, while the mother does her work. Its hands being tied in, its poor little eyes often are covered with flies. When sun and flies become too much for its patience, it whimpers meekly and the mother throws the other end of the *tobe* over its head and waggles it to sleep.

Both boys and girls have their tribal marks cut on their cheeks at an early age, salt being rubbed in to keep the slits open. Little girls wear a *rahad*, a short skirt of strings of leather hanging from a belt, which swings picturesquely like a kilt as they walk. If there is enough rough cotton cloth to go round, the boys have a sacklike shirt with holes for their arms; otherwise they go as God made them.

Owing to the Arab invasion of northern Africa many centuries ago, the Moslem religion extends from the Red Sea to the West African Coast. It is laid down in the Koran that all devout followers of the Prophet who are able to do so must make the sacred pilgrimage to Mecca once in their lifetime.

The wealthy Mohammedans from West



THE CALF OF THE OPPOSITE PAGE A FEW MONTHS LATER

The flesh of the young camel is said to resemble veal and is a favorite food for Arabs, while camel's milk is highly prized as a beverage.

Africa take ships from those ports and go by way of the Mediterranean Sea, Suez Canal, and Red Sea to Jidda; but this route is closed to the poorer class, who, therefore, have to travel overland.

Selling all that they possess, the hardy Hausa tribesmen of Nigeria purchase as many bulls and cows as they can and set out, the children and old women being mounted on the patient beasts, upon which also are loaded cooking pots and innumerable bits of paraphernalia. The braves amble along, brandishing their throwing spears, while the oldest man carries a spear about 10 feet long to add to the dignity of his age.

### TWO YEARS FROM MECCA

The journey to Mecca takes about two years. Much of the ground to be covered is practically waterless, and there are great hardships to endure.

The pilgrims follow the main caravan routes across Nigeria, on through French Equatorial Africa, approaching Darfur Province through Abeshr.

In the time of the Sultan Ali Dinar the pilgrims paid heavy tolls to him; their fairest daughters often were forcibly taken to adorn his harem, and their cattle impounded to pay imaginary taxes. The reoccupation of Darfur by the Anglo-Egyptian Sudan Government therefore is of immense benefit to these pilgrims, as they now have the protection of either the French or British governments throughout their route.

Even so, there are many difficulties to be overcome. At various larger centers the little parties settle down, sometimes for months at a time, hewing wood and drawing water or cutting grass for the more indolent Arabs, thereby earning enough money to provide them with food for the journey to the next place. At El Obeid they rest a long time, laboriously earning enough money for the railway fare to Khartum, and then proceed to Suakin or Port Sudan. Thence they are taken in Arab *dhows* to Jidda, the Red Sea port for Mecca on the Arabian coast.

A SLEEPING CAMEL

Observe the heavy sand and the size of the flies on the beast.

For some time our market place consisted of a few hurdles, balanced at great hazard on twisted poles, and the only venders were a few women who did a trade in native beer. Their sales fluctuated according to the proximity of the soldiers' and policemen's pay days.

### A JUVENILE RETAILER CAPTURES TRADE

Occasionally some daring soul introduced eggs and watermelons. Then a merchant prince appeared. He was about ten years old, the son of the sergeant major of police, and had the great distinction of being able to read and write. The first day, when he established his claim, a little red pepper constituted his stock in trade. Matches made their appearance soon. Then he thought the ladies wanted something to add to their natural charms, and he launched out into perfume, featuring crushed sandalwood, and two other sorts of wooden twigs. A few days later, although we were miles from anywhere, this amazing boy introduced a kind of red paint for the finger nails, which was closely followed by cigarettes.

Finally an old government blanket of his father's gave a pleasant shade during the heat of the day, and strings of beads were hung up in front of the shop. The whole stock was displayed to greater advantage on a grass mat, which was adorned at each corner by a sugar-loaf, carefully wrapped up in its blue paper.

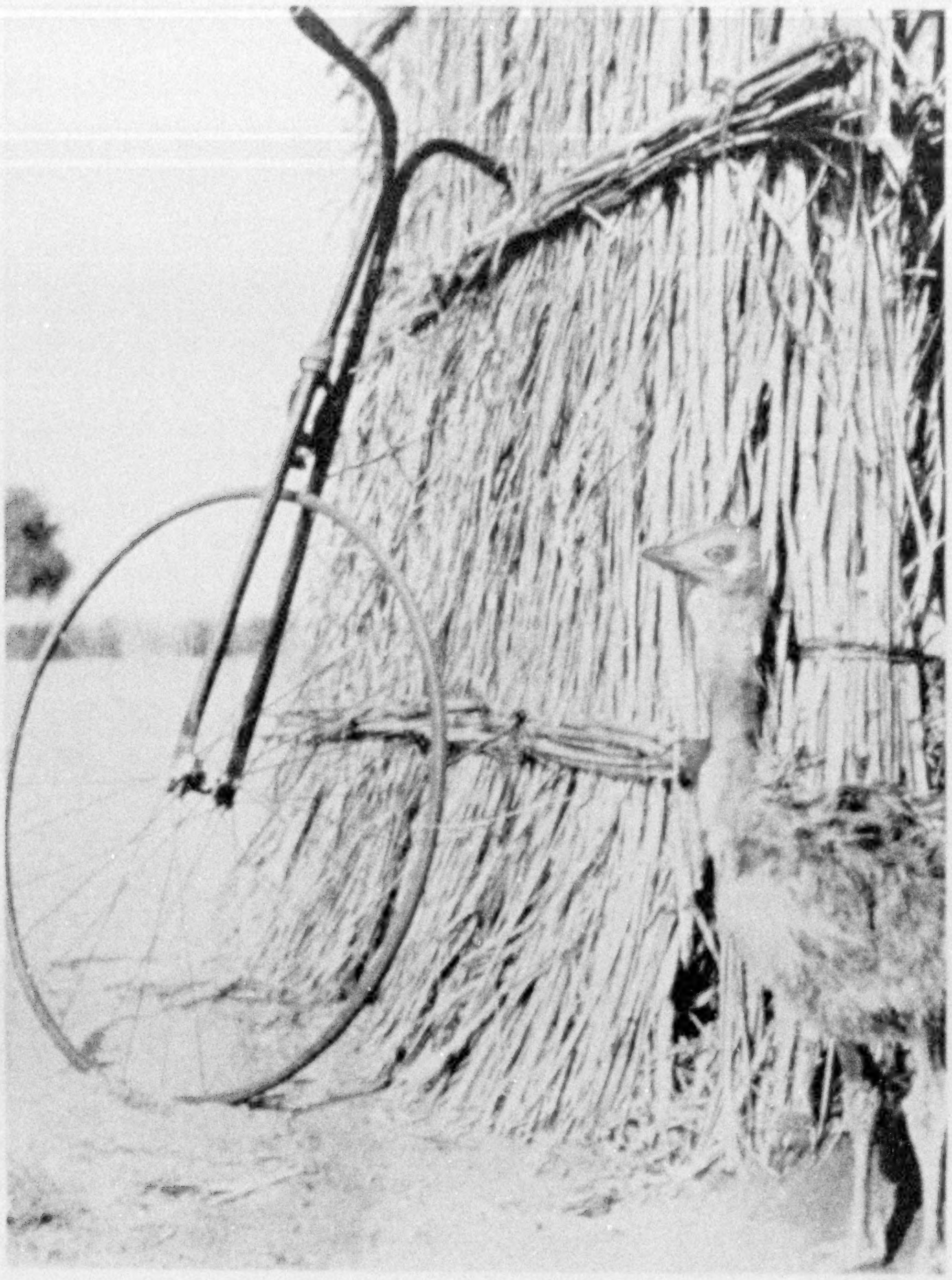
An Arab merchant from Khartum arrived, and he traded off European cotton cloth for cattle and gum.

### THE CHIEF OCCUPATION OF THE NATIVE

The principal occupation of a native man of Darfur is killing time, and his average daily round is as follows:

An early riser, he is up betimes to send his women off, either to the well or to the tebeldi tree to get water. If he owns a fair number of animals, he accompanies the women and assists them. He then sees the animals driven out to pasture by a small boy, who is responsible for bringing them back at night. That finished, his day's work is done.

His wife returns and at once busies herself preparing grain for the thick, fermented beer, like pea soup, which is the principal means of sustenance. She thus occupies practically her entire day. Meanwhile her lord and master sleeps until sunset, recuperating his strength. If he is feeling very energetic, he perhaps spins a little cotton or weaves some cloth, squatting outside his tukl so that he can keep an eye on his women and see that they do not slack off.



THE SURVEY WHEEL USED BY THE AUTHOR IN MAPPING DARFUR

As his province was practically unmapped, wherever Major Keith-Roach traveled he had a native push a cyclometer before him, so that the distance might be accurately noted. Bearings taken with a prismatic compass were also recorded (see text, page 57). Note the baby ostrich in the foreground.

### WIVES' WORK CAREFULLY APPORTIONED

As soon as the first rains come, the man goes off with his wife or wives and escorts each to her own patch, because each has her own seed supply, just as each has a separate house.

Holding in both hands a branch of a tree that is bent at nearly a right angle, with sometimes a small iron hoe at the end, he ambles at a jog trot down the cultivated plot. Each time the left foot comes to the ground he gives a jab at the soil at his left side, which displaces the sand a little. When he has gone about fifty paces he turns at right angles, gives a jab, and then turns again and makes a fresh line parallel to the other.

His faithful helpmate walks behind him with the millet seed in a dried watermelon rind, and, without bending, drops a few seeds into the hole, brushes it over with her foot, and passes on to the next. In a day they can plant an extensive area.

As soon as all is planted, he and she wait until the seeds begin to sprout, unless he has planted when the rains are due. This he frequently does in feverish anxiety—the only time he ever exhibits this trait. Then it often happens that there is a dry spell for a month, in which case the grain dies and the work has to be done over again.

### LOCUSTS COME AND WORRY BEGINS

After three weeks of good rain and ample sunshine, the grain comes up, and with it the everlasting haskaneet; so he takes his only other tool, a half-moon-shaped hoe, and hoes the weeds. This is rather harder work, since it entails some back-bending, although the handle is made as long as possible.

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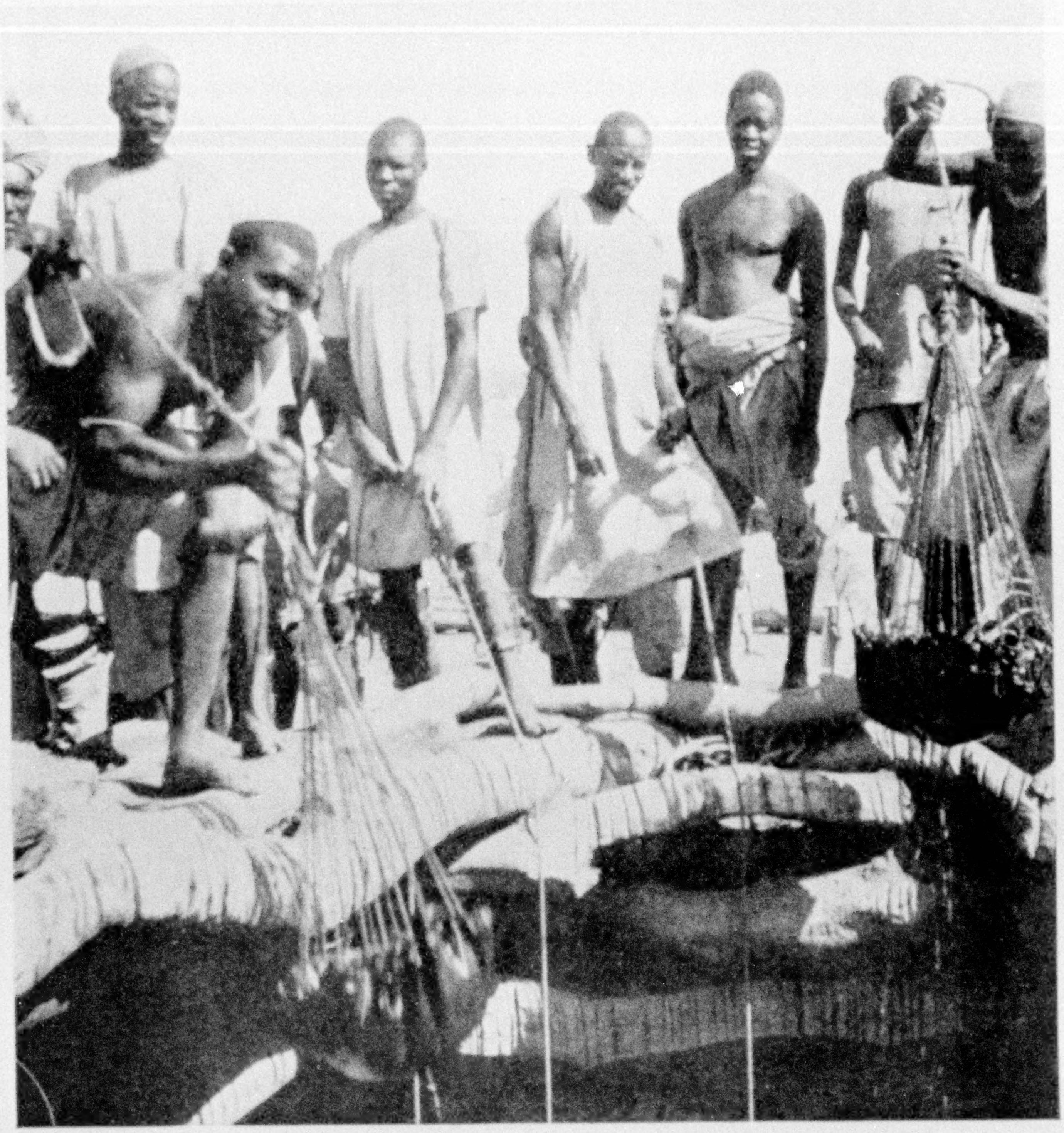


HOISTING WATER FROM A DARFUR WELL

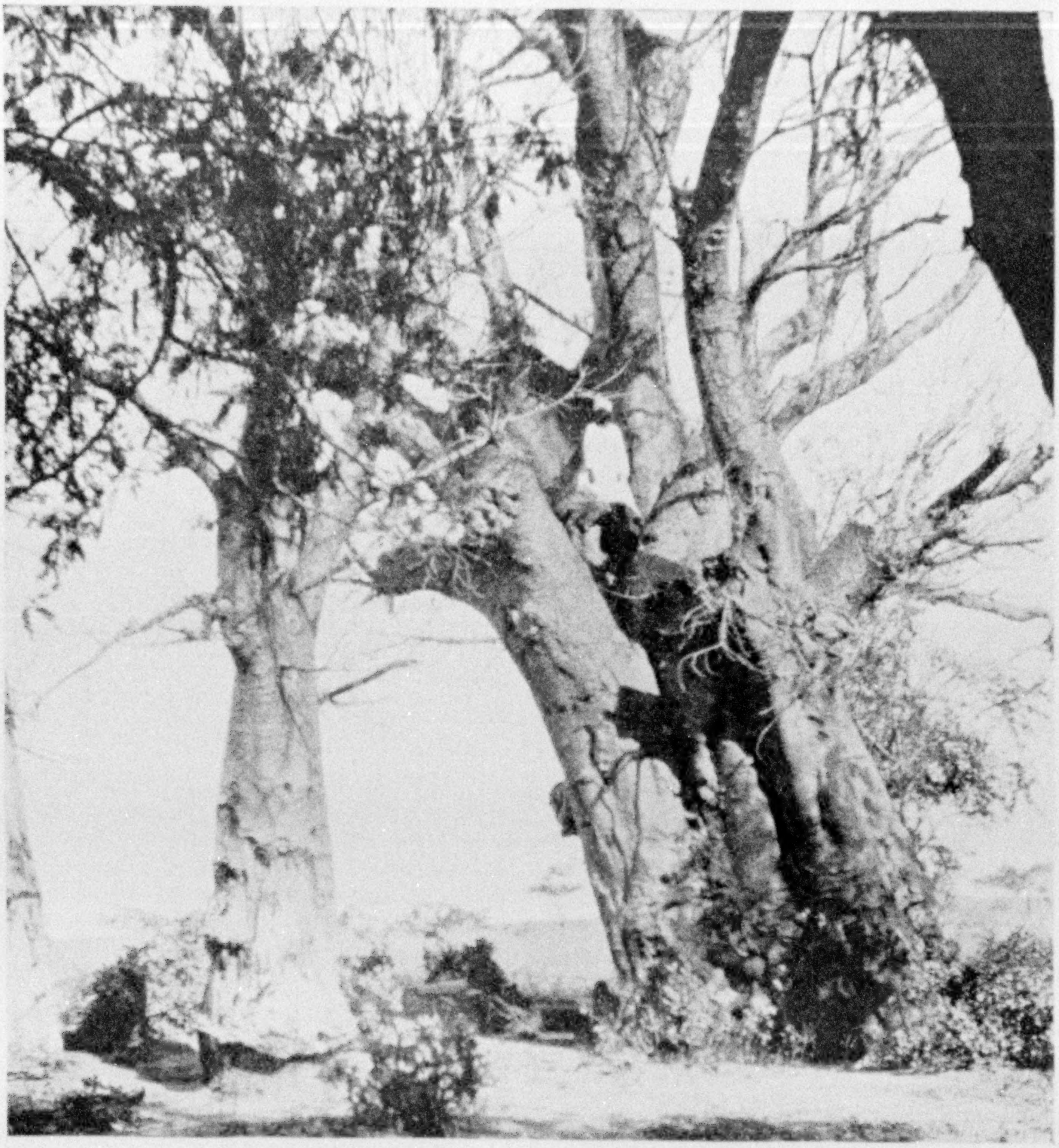
The problem of drinking water for man and beast is a serious one in this province, much of which is extremely arid. To supplement wells, the tebeldi trees are sometimes used as storage tanks (see text, pages 64-65, and illustration on opposite page).

After a few more days the crop rises to an appreciable height. Then the one serious worry, fear of locusts, begins. These pests sometimes come in myriads, eating every green thing before them. When they are seen approaching, man, woman, small child, and grandmother hasten to the field and raise a din to try to prevent them from settling. The crop will suffer if each locust takes only one bite, as it sometimes takes an hour or two for a flight to cross the fields.

At the end of four months, if the crop has safely passed through these vicissitudes, the millet is ripe, grown to a height of six feet. The head, some ten inches long, is snipped off and taken to a hard piece of ground near by, where the grain is beaten out by hand. The grain then is winnowed by being thrown in the air, after which it is stored in small pits dug in the ground, to be removed as required.

The long stalks of the millet are used for making tukls, and the remainder, left standing in the fields, is burned later.

A few industrious natives have a source



A TEBELDI TREE, USED AS A WATER RESERVOIR IN SOME PARTS OF DARFUR

When the inside is scooped out, without killing the tree, a tank of from 500 to 1,000 gallons' capacity is available (see text, page 65). The native in the branches of the tree to the right has his leg stretched across the water hole.

of wealth in gum trees, and are able to make a considerable sum of money from the sale of their product as gum arabic. The bushy evergreen trees, with spiky branches, grow wild over nearly the whole of Eastern Darfur.

Tapping the gum starts at the end of October and continues for about five months. Four or five men go out together and tap each other's "gardens" in turn. Armed with a small homemade ax, they beat the bark of the tree a few times to loosen it, then make a cut, and tear the strip upward for a foot or so. If this is carefully done and the incision is not too deep, the stripping removes only the outer bark with a little of the reddish fiber beneath, and does not expose the white wood. If the white wood is uncovered it is liable to attack by white ants and does not heal up properly the next rainy season.

The trees are then left for about 15 days, by the end of which time all the "gardens" have been attended to, and men come back and collect the gum that has

MELONS ARE EXTENSIVELY CULTIVATED IN DARFUR

When the crop has matured the fruit is stored under low-thatched shanties. The pulp is eaten by the natives, and in the dry season quenches thirst (see text, page 65), the pounded rind is fed to live stock, and the seeds are made into a salve for skin diseases.

oozed out at the bottom of the barked portion. Other parts of the trunk are then dealt with until the tree has exhausted itself.

The collected gum is taken to the village and buried in the ground until an opportunity occurs to take it to market, which may be a hundred miles away.

### PRIMITIVE TEXTILE MAKING

The cotton crop is very poor; the pod is mostly seed, with the minimum of cotton.

It is ginned between rough rollers, cleaned by being twanged on the string of a bow, and spun by rolling a spindle on the inside part of the thigh.

Little attempt is made to obtain even thickness of the yarn, which is transferred to a bobbin for work in a primitive loom. The warp is formed of about 160 twines, 20 feet long. The shuttle is worked with speed, and an old and experienced man can weave a tobe of twenty feet in two days.

The width of the cloth is one *diraa*—about the length of the forearm plus the width of the hand. It is not made wider because that would require a little more exertion for the man by making him stretch his arms. As it is so narrow, two sides have to be stitched together to make a garment. I suggested to an old man that it would be better if he made a tobe of two diraas' width, and he treated the idea as if it were the best joke he had heard for many a year.

From the finished cotton the men fashion some sort of a rough shirt and trousers, but the women just wrap it around themselves and it serves as skirt and bodice.

### TREES ARE WATER WELLS

Throughout Eastern Darfur there are few wells and no permanent water supply; therefore the natives rely entirely on the rains of July, August, and September. On an average, 15 to 20 inches may be expected during this period. The problem of storage for the remaining nine months is solved in a most interesting manner.

Dotted here and there, sometimes in tens, fifties, or even hundreds, there are

THE BEGINNING OF THE RAINY SEASON IN DARFUR

trees formed of a soft, spongy wood with a naturally hollow heart. The outside bark is soft and knobby and is covered with a gum that oozes out of the trunk. They are of very slow growth, and from their size must be of enormous age. They grow fairly straight, sometimes 20 or 25 feet high, before branching off into large boughs.

Many of these trees are of great girth, and two I walked around measured twenty paces. The natural hollow is scooped out and enlarged, leaving a foot's thickness of wood on the outside and some three or more at the bottom. Thus, because of their huge girth, their storage capacity is considerable. Into these living reservoirs the people, using primitive leather buckets, pour the rain water collected from hollows among the roots. The contents of the trees vary between 500 and 1,000 gallons.

In the hot weather the water gets unpleasantly warm, but remains sweet. Toward the end of the dry season, just before the rains break, it is naturally very scarce, and travelers are often asked twenty piasters ($1) for three gallons.

In areas where there are no tebeldi trees and reservoirs are unobtainable, the resources of Nature are not exhausted.

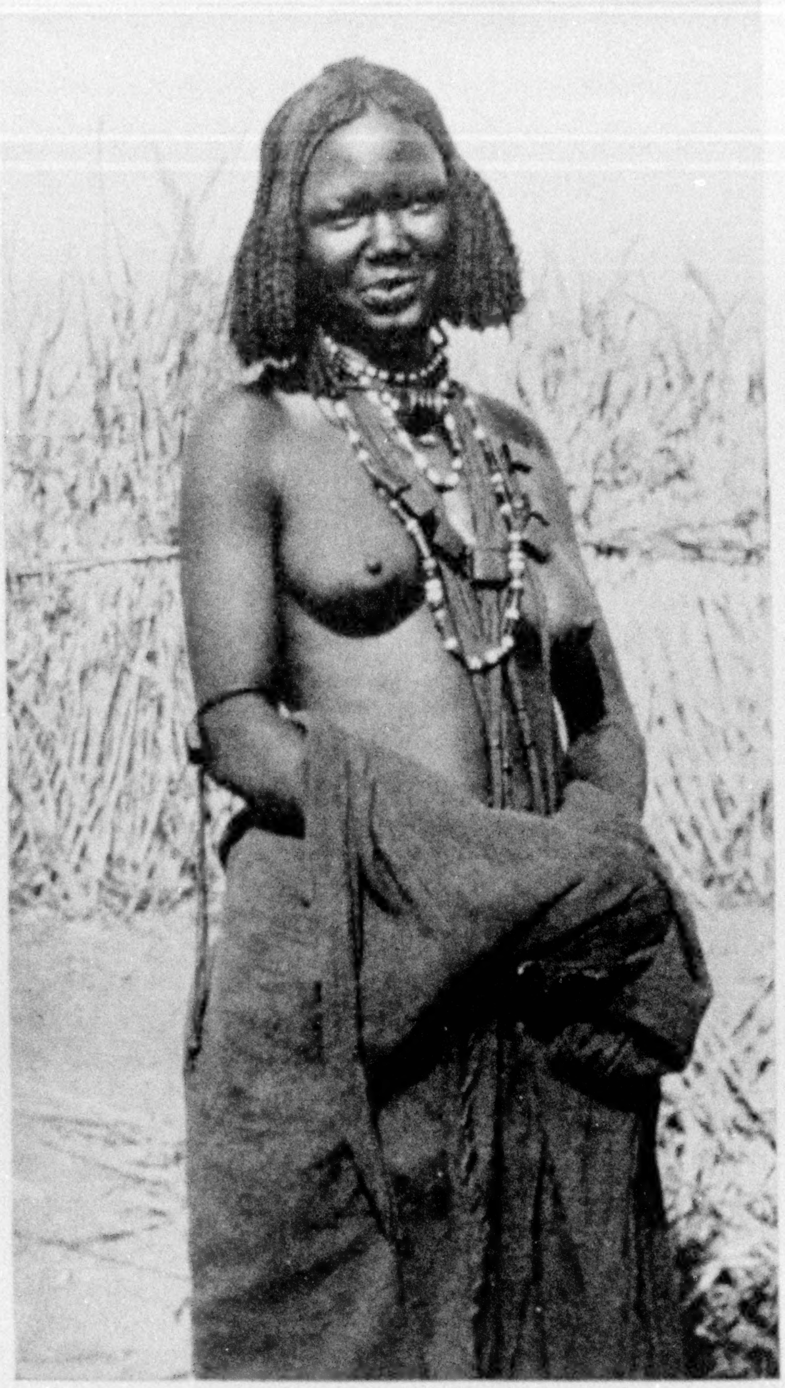
*Batikhs*, or watermelons, do not grow wild, but are sown in large areas of cleared ground. When the fruits are ripe they are stored away under low-thatched shanties.

Toward sunset the ever-patient donkey is driven down to the field, and enough melons brought back for the next day's use.

### MELON YIELDS FOOD, DRINK, FORAGE, AND MEDICINE

A woman brings an earthen vessel with perforated bottom from the smoke-begrimed tukl and squats beside it. Taking a melon, she breaks it with her clenched fist, and, with a hand that is far from clean, scoops out the inside, throwing the rind into the sand again. When all the pulp has been extracted it is teased and squeezed to break up the fiber. The vessel is placed on another and the liquid percolates through straws at the bottom.

The rind is then broken up and pounded in a vessel fashioned out of a tree trunk. All possible moisture is withdrawn and



A YOUNG WOMAN OF DARFUR

the residue becomes food and drink for donkey, goat, and fowl.

Once, when touring to complete my map, I lived for six weeks, using these melons for my sole water supply, and beyond being unable to shave, suffered little ill-effect; but for sheer nastiness, I commend you to tea made from strained watermelon juice.

In a country where everything is of value, time excepted, it is to be expected that some use would be found for the seeds of the watermelon, but expectancy could hardly have predicted the particular manner in which they are employed. In some countries they are dried and strung together and form the principal item of dress of the native. In Darfur, however, they have a far more precious, if utilitarian, value. They take the place of coal tar, sulphur, and all the various prescriptions devised to combat skin diseases.

After the moisture has been drawn off from them, they are lightly dried and a mixture called *gutran* is made. A hole is dug in the ground and a tortoise shell placed in it. A clay vessel is filled with the seeds, wood ash, with dung placed on top, and suspended over the shell. The whole is then covered with a fire. The moisture from the seeds drips through holes at the bottom of the vessel, and after a couple of hours there is a pint or so of thick, black, soupy substance in the tortoise shell.

An animal suffering from skin disease is rubbed over with the mixture, and after a few applications the old hair falls off, showing the skin clean beneath.

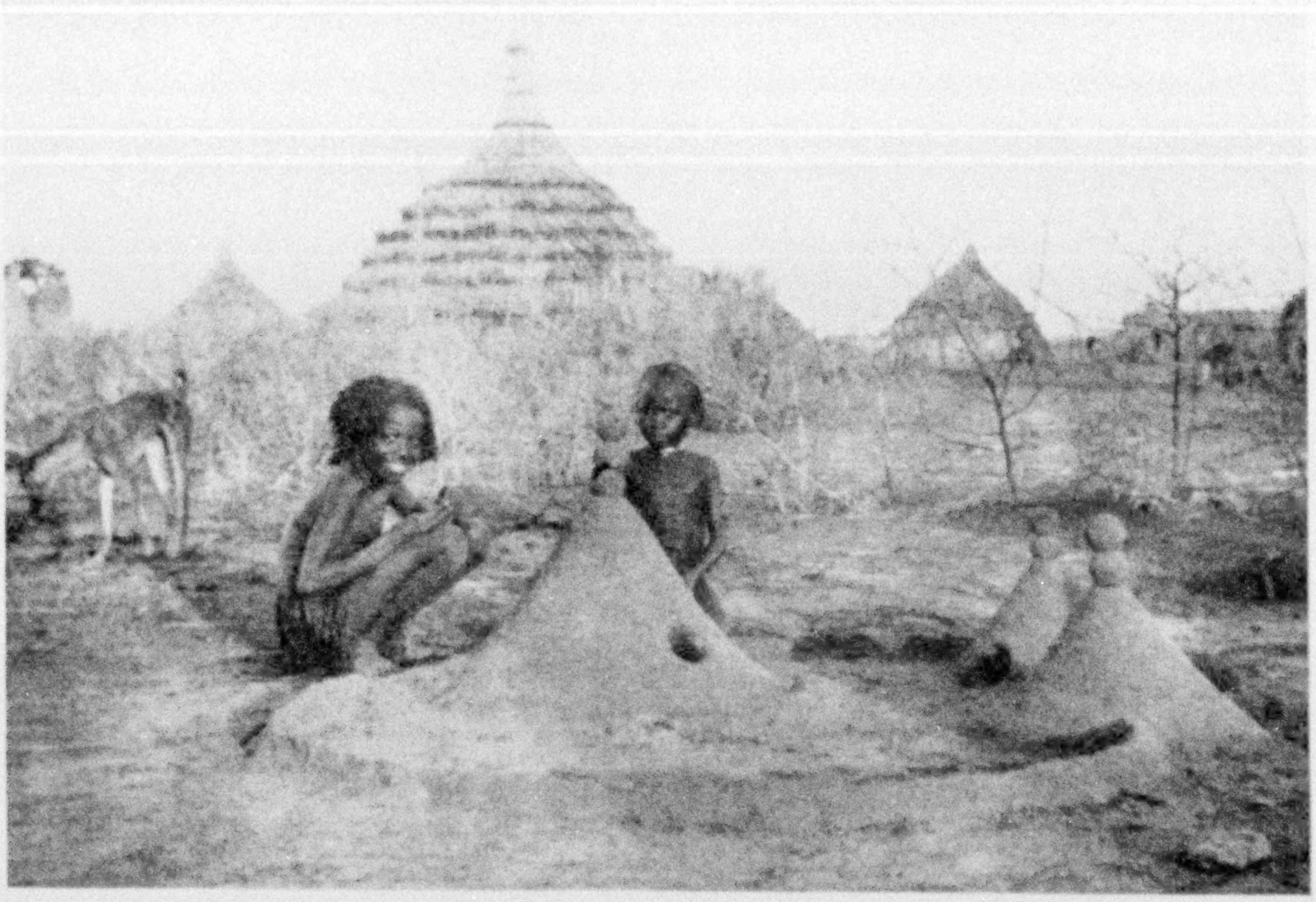
Mixed with wood ash, it is also used for curing skins.

### STRICT CONVENTIONS FOR DYING

One morning I was requested by the omda to go and see a man who *ous yemoot*—wants to die. I picked up my thermometer and medicines and set off for the tukl. Upon my arrival I found it crowded with people, old and young, relatives and total strangers, all gathered together to help the sufferer pass away.

The man, lying on the sand in the tukl, was *in extremis* and there was little hope. He had been attacked by one of those rapid fevers that come with such dramatic swiftness and call the strong almost before one is aware that they are ill.

Within a minute or two of my arrival the man was nearing his end. As soon as the watchers observed this they quickly pushed him over on his right side, one holding him in that position while another pulled his hands down in front of him to the full extent of his arms. His wife, who was squatting beside him on the right, placed his chin in her left hand.



PLAYING "HOUSE" IN DARFUR

The author describes this photograph as "probably unique, as it shows the only children I ever saw in the Sudan really playing." Their mud houses, of course, follow the customary lines of the tukl (native hut).

forcing his mouth to close, while her thumb and forefinger were placed over his eyes, closing them. Her right hand patted his left shoulder, while she shook with convulsive sobs.

Any chance that one had of administering a stimulant was therefore defeated, as for at least five minutes before death he was kept in this position, so that he might die in the conventional way. There was a struggle for breath, but the hand never relaxed its hold on the mouth. I turned away in horror and as I passed from the hut all was over.

During the whole of this procedure the man's aged mother kept crying out: "Allah el akbar. El hamd el Allah." (God the greatest. Praise be to God.)

He died at 10 a. m. and I was invited to the funeral, which took place at 4 p. m.

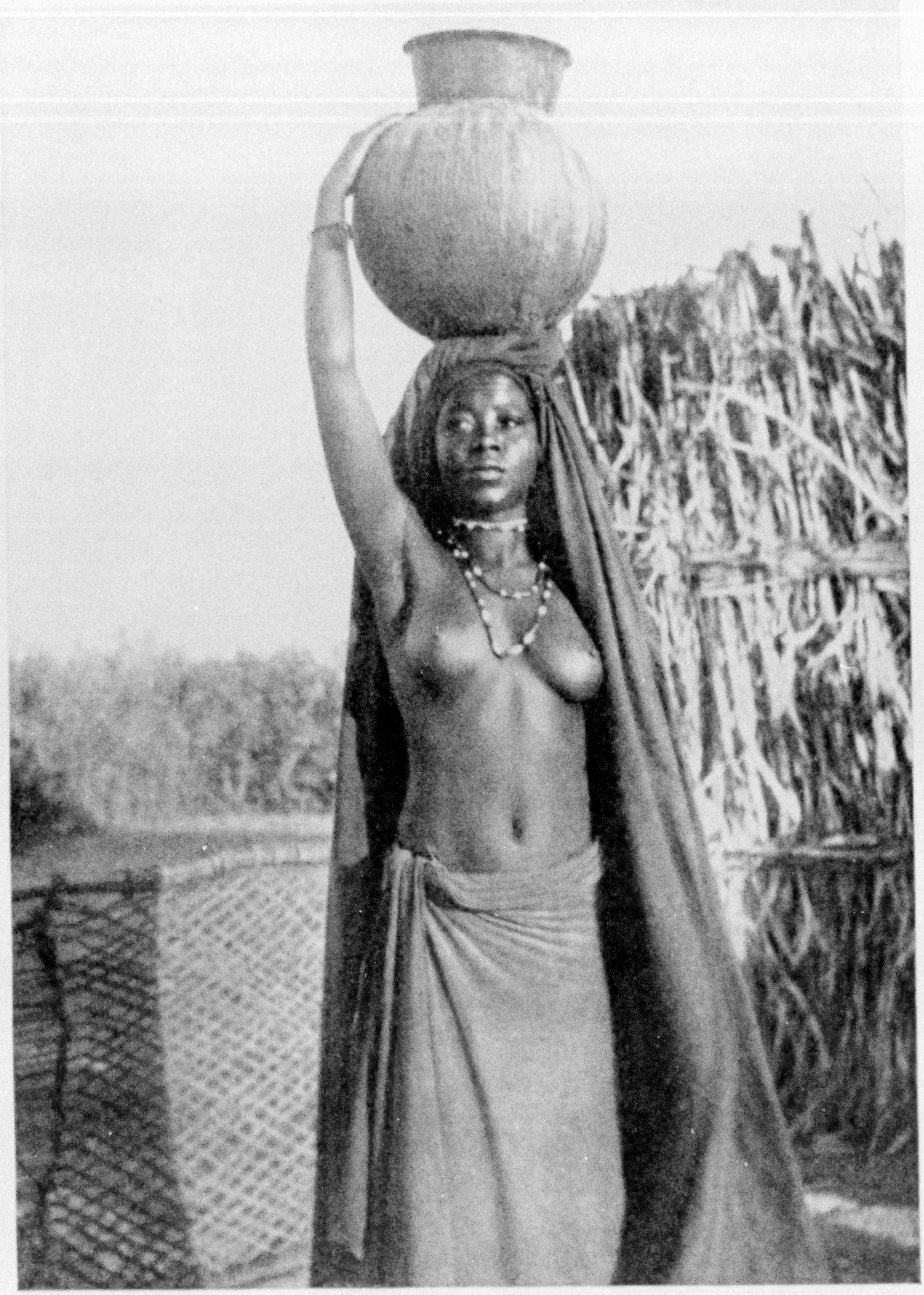
### MUST FACE MECCA IN GRAVE

I rode out to join the funeral procession, which set off at a dogtrot, while the wife kept pouring forth a lament in a sad, haunting strain that awakened all one's sympathy.

On arrival at the graveside the importance of the man's dying on his right side was at once evident. A trench had been dug, three feet wide and two feet deep. Then, in the middle of this, a second long, narrow trench one foot wide and a foot and a half deep was dug, widened at one end for the feet.

The *Kadi* arrived. He repeated "God is the greatest" five times, and then the body was lowered into the deeper trench, resting on its right side, with the face looking toward Mecca. Short pieces of wood that had been cut from the adjoining bushes were placed across the narrow trench in the middle of the larger one. Splinters of wood were put in the cracks.

Water brought in goatskins was poured on sand by the side of the grave, and this was mixed into mud, which was plastered over the wood. Then all the mourners gathered around and, squatting on their heels, shoveled on sand with their hands. Some bushes were brought, an enclosure of thorns was made around the grave, and then the mourners silently went their several ways



A COMELY FUROWIAH

The women of Darfur do the hard labor, while the men devote most of their days to resting.

There is much sameness about visits of ceremony. The following is typical of many. The headman of the village received me with great ceremony outside his tukl, conducted me inside, and put me to sit on his native bed, the only thing to sit upon in the dwelling. A large watermelon was produced from under the bed, and from this he cut me an enormous slice, then sat at my feet, watching every mouthful.

A mysterious but heated argument which had been going on for some time outside ceased, and the man's two bearded sons brought in the meal—big flat cakes made of millet flour, a mess of eggs and sour milk beaten together, and a pot of beautifully cooked chickens. The chickens the father pulled to pieces with his hands and presented to me on a small grass mat.

This course was followed by excellent coffee, served in little cups without handles. I had three cups, thinking the meal finished, but an ancient teapot was brought forth, and I capped my repast with a cup of strong, bitter tea, sweetened to a nauseating degree.

### A DISCONCERTING FAREWELL

The omda and I talked of many things, and after inspecting his water supply, live stock, and fields, I turned to leave. His two sons were mounted, ready to see me on my way. The old man signed to me to stop. Then the two younger men cantered off some distance, turned suddenly around and, thrashing their horses with their *kurbags* (rhinoceros hide whips), dashed straight at me at a full gallop, pulling their foaming horses back on their haunches about six inches from me. The nearer the visitor, the greater the compliment.

Their bits are very severe and cruel. A curb squeezes the underpart of the jaw and a great port on the bit springs up and hits the roof of the mouth when slight pressure is put on the rein. When galloping the natives appear to be going very fast, but half the time the horse is prancing in the air in fear of the bit's being applied. Any small pony properly bitted and lying on his bit could give them lengths in one or two furlongs.

Nothing is new under the sun and, if one only looks far enough back, it is not difficult to find a precedent for any case that comes up.

### MOSAIC LAW APPLIED TO MOSLEMS

Picture a scorching day in the height of the hot weather, and half a dozen natives all talking at once in my office, the crescendo voice of an old woman rising above the others. As soon as they were exhausted by their shouts, which I assure the reader took time, I gathered that the bull of Ahmed had had a fight at the village well a couple of nights before with the favorite bull of Mohamed, and had knocked it down the well, where it died of a broken neck.

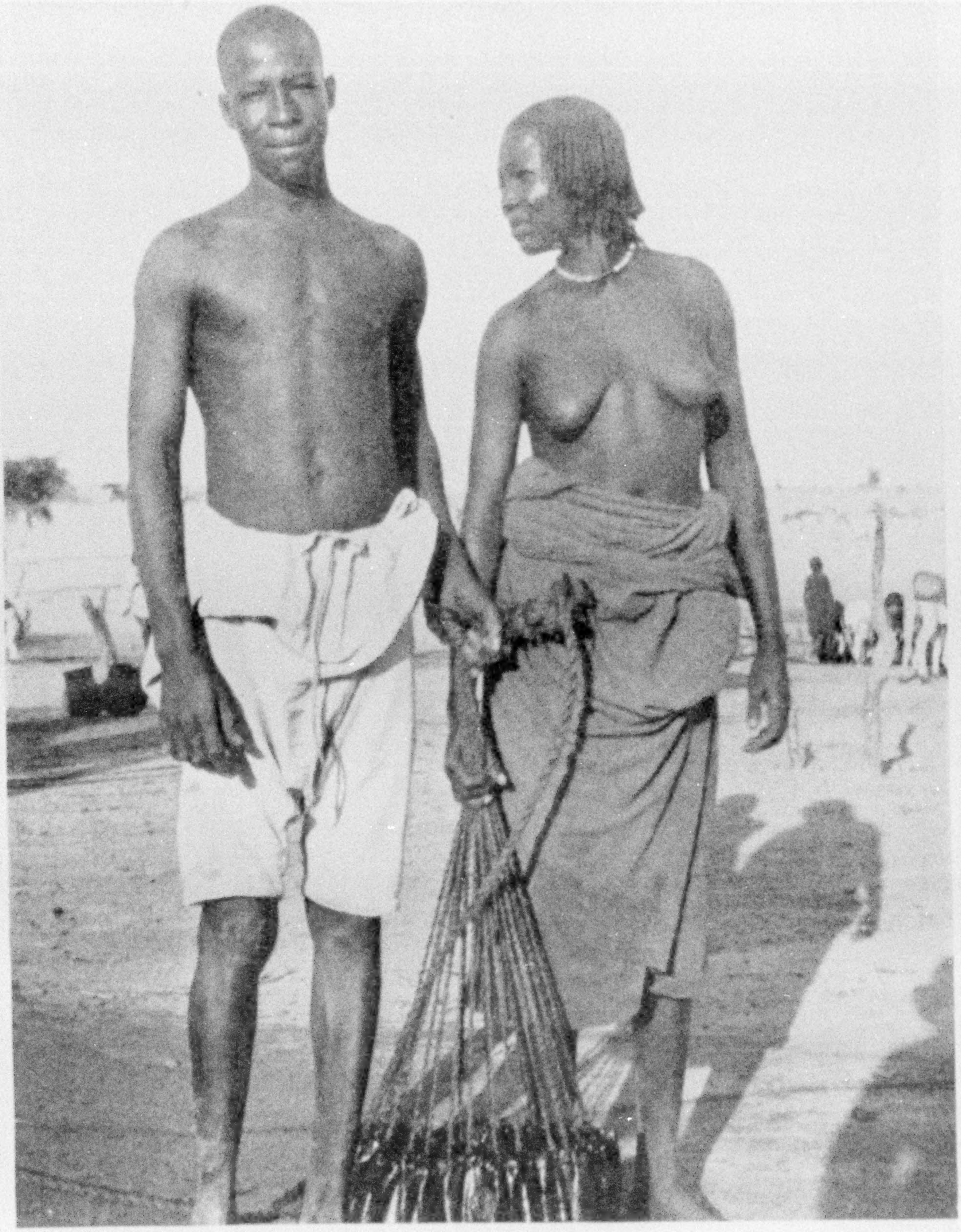
Mohamed was lowered at once down the well, slit the throat of the beast in accordance with the tenets of his religion, drew it to the surface, and sold it for butcher's meat for about the equivalent of five dollars. He now claimed the difference between the living animal and the sale price of the dead beast. Ahmed admitted that the fight took place, but contended that his beast had been attacked first, and therefore no compensation was due. Vociferous witnesses, including the shrill-voiced woman, stated that it was a case of "fifty-fifty."

When it was nearing 3 o'clock, after I had been hard at it from 8 o'clock in the morning, I cleared the court and said that judgment would be given next morning.

Literature is a great stand-by to officials living alone in the desert places of the world. During the World War, when often there were no mails from home for ten to twelve weeks at a time, reading matter was hard to come by, and one became a student of the Bible.

That night after dinner, as I lazily turned over the pages of the Bible, I by chance turned to the twenty-first chapter of Exodus, and the thirty-fifth verse gave me the solution to my problem of the morning. Next day, carrying my Bible, I went to court.

It must here be explained that the Moslems have taken to themselves the majority of the old prophets and hold them in great reverence. As soon as the court assembled I explained to the litigants that a similar case had occurred about 3,400 years ago, and the great *Nebi Mousa* (Prophet Moses) had given a law thereon which I proposed to follow. I



BROTHER AND SISTER OF DARFUR CARRYING A LEATHER BUCKET

Although the inhabitants of Eastern Darfur call themselves Arabs and speak that tongue, they are negroids (see text, page 57).

then read the verse: "And if one man's ox hurts another's, that he die; then they shall sell the live ox, and divide the money of it; and the dead ox also they shall divide."

It was decided that the value of the living ox was about $25; so, as Mohamed had already sold his dead beast for $5, I ordered Ahmed to pay him over $10, and the case would be fairly settled.

This judgment gave great satisfaction to all parties and they went away happy to their village.

### BIBLE PROVIDES ANOTHER RULING

Now for an extraordinary sequel.

Months afterward I was out on tour, and as I neared the village of these litigants at nightfall I was met by a gesticulating Ahmed, who shouted that this very morning his ox had been attacked at the well, but, unfortunately, this time he was the sufferer and his ox had been thrown down the well by another's.

After dinner that night, by the light of a glimmering candle, practically all the inhabitants sat round in the sand while I heard the case. It was proved to my satisfaction that Ahmed's beast was quarrelsome and had fought with several other animals that morning, but had been driven off. In the case under review he was clearly the aggressor, but the fortune of war was against him.

Although I did not know whether this particular case was provided for in the Bible, I said that I would look and see whether the Great Prophet had a law for such a contingency.

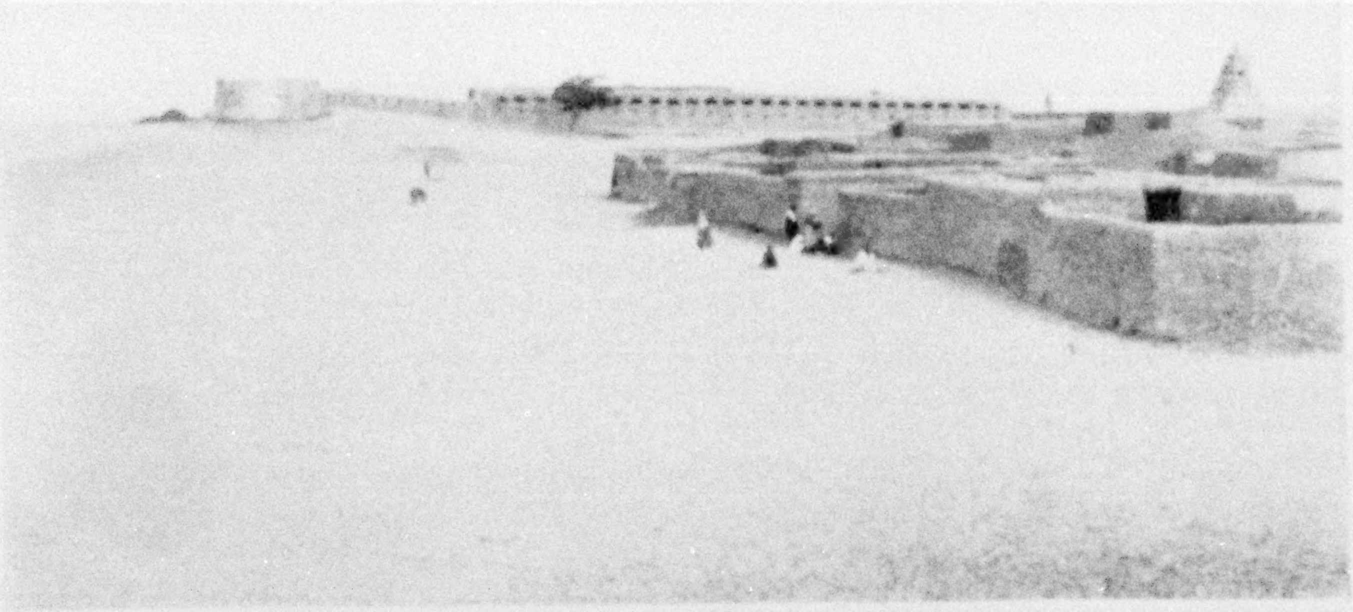
I then opened the same chapter of the Book of Exodus, and in the last verse found a suitable judgment, which I proceeded to translate to the assembled people.

"Or if it be known that the ox hath used to push in time past, and his owner hath not kept him in; he shall surely pay ox for ox; and the dead shall be his own."

Under these circumstances, as the pushing ox was in this instance dead, I ordered that no compensation be paid by the owner of the living to Ahmed.

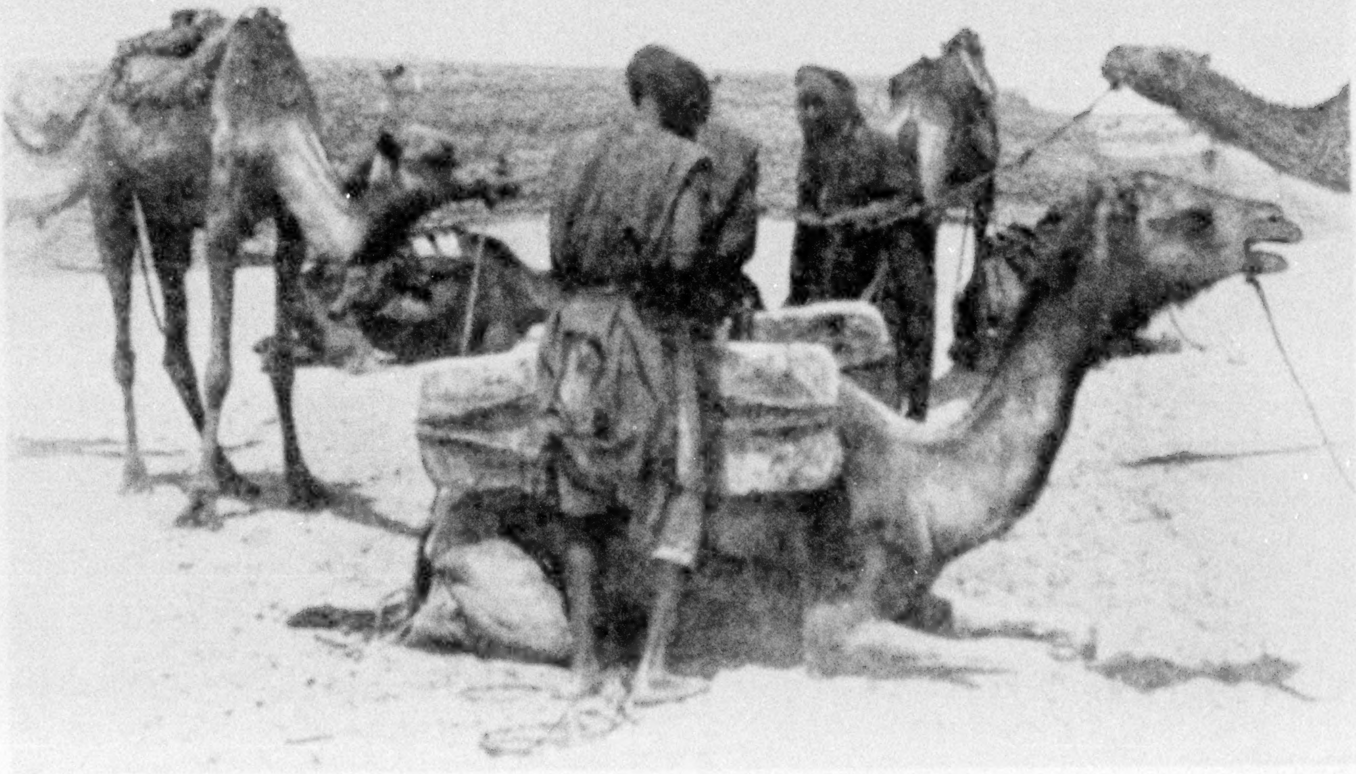
THE HEAD OF THE LIONESS SLAIN BY THREE BOYS OF DARFUR

A youthful hunter having been struck down, one of his companions, wrapping his long garment around his arm, thrust it down the lioness' throat, while the third boy, armed with a small hatchet, rained blows upon the animal's head until it fell dead (see text, page 72).



TIMBUKTU, MYSTERIOUS CITY OF THE SAHARA (SEE MAP, PAGE 46)

This ancient city of nomads and Moors was formerly a fabulously rich and powerful commercial metropolis of the Sahara. Standing in the midst of burning, shifting sands and a parched vegetation of gum trees, mimosas, and coarse grass, Timbuktu was founded in 1077 by the Tuareg Berbers, then passed into Moorish hands. Mohammedan fanaticism frightened Christians away from it until 1826. Joffre occupied it for the French in 1893.



Photographs by Agence Economique du Gouvernement Général de l'Afrique Occidentale Française

UNLOADING BARS OF SALT

The most exciting event of the year at Timbuktu is the arrival of the salt caravan (see page 80), when natives come in from miles around to purchase a year's supply of the precious commodity, which is obtained from desert mines 300 miles north of the city.

My decision was greeted with shouts of applause, in which, I am glad to say, Ahmed joined, and the people once more were convinced of the wisdom of their revered Prophet.

### WHY VILLAGE BELLES WORE LION MEAT IN THEIR HAIR

The Furowi may have many failings, but lack of courage cannot be counted among them.

One morning an oldish man walked into my office and said that a lion and a lioness were molesting the peace of his village, about 15 miles away. He wished me to come and destroy the beasts. I promised to go the following day, but unfortunately the investigation of a case of murder occupied my attention and I could not go.

The day after, the old man came before me, dangling at the end of a piece of rope what I at first thought was a skin of honey, but a second glance showed it was the head of a lioness. He told a story which I corroborated the same afternoon when I went to the village to dress the wounds of the chief actors.

Three boys of about 15 or 16 years—no Arab knows his exact age, but calculates by the time of some striking incident—went out to their field, each carrying a small throwing spear, and they saw the lion and his mate under a bush. The first lad threw his spear and missed, and the quarry bounded off under another bush. The next boy hurled his spear and also missed. A third spear hurtled through the air from the arm of the youngest lad and struck the lioness in the side. She immediately turned and, with one spring, seized the thrower round the shoulders, threw him to the ground, and began gnawing at his neck.

One of the boys took off the long garment he was wearing, bound it swiftly around his right arm, and, grasping the animal's left ear with his left hand, drove his right arm down her throat. As her teeth closed on his arm, the third Arab picked up his small hatchet and rained blows on the head of the lioness until she fell dead at their feet.

The boys soon recovered from their wounds, and for weeks afterward all the girls of the village wore little pieces of lion meat in their hair as a tribute to the prowess of the young men.

The skin of the lioness now adorns my drawing-room on the Mount of Olives, Jerusalem.

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# TIMBUKTU, IN THE SANDS OF THE SAHARA

## By Captain Cecil D. Priest

MANY people have asked me if Timbuktu is an island; others have said they thought it a myth. The truth is that Timbuktu is a famous old city in French West Africa.

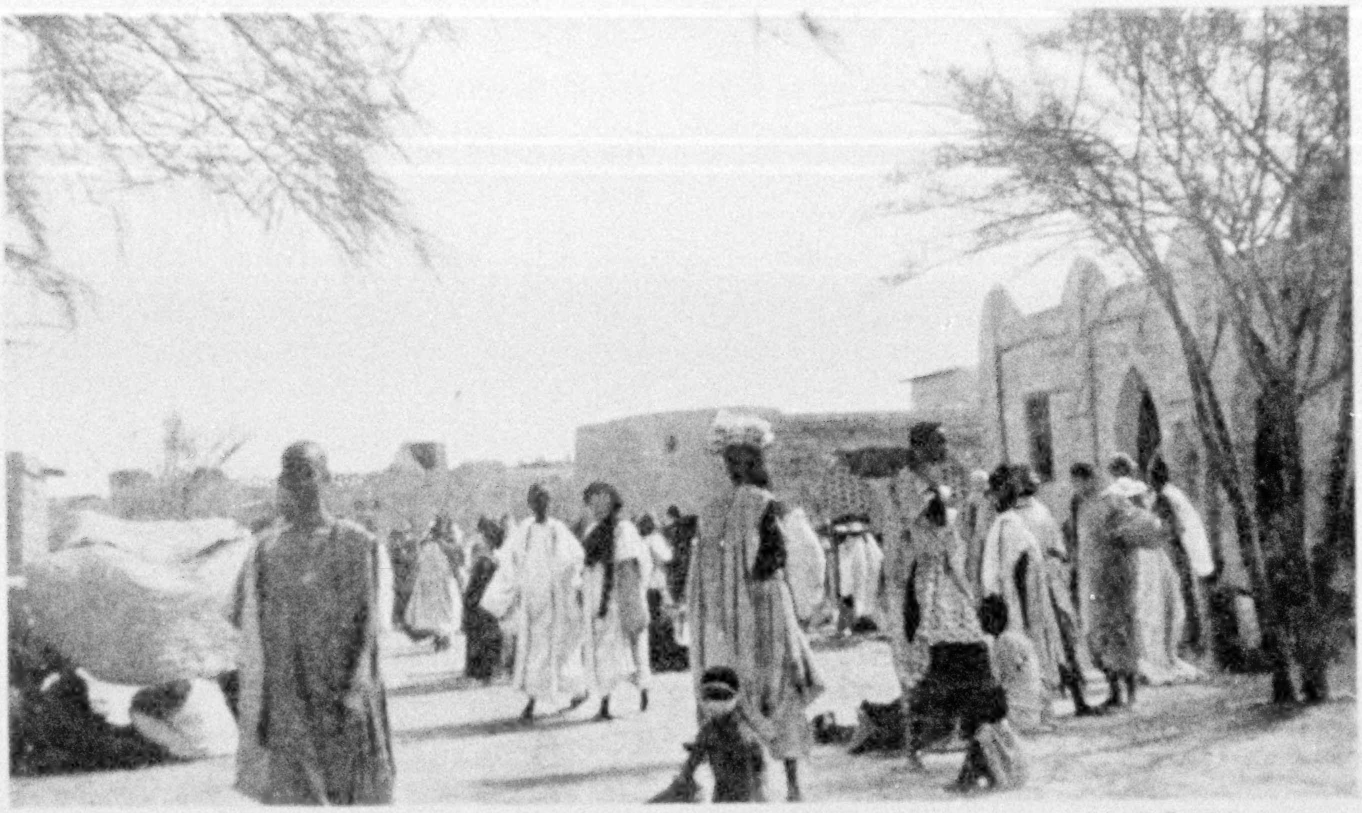
The town is situated about nine miles from the most northerly point of the river Niger. In the rainy season it is reached by a canal from Kabara, the so-called port; in the dry season, when the river is very low, a canoe can go only as far as Koryiamo, from which point a pony carries the traveler across dry marshland and sand-dunes to this mysterious city.

I shall never forget the morning I arrived. Here was my Mecca at last, haunted by dreams of the curious and imaginative the world over. Eagerly I scanned the horizon for a glimpse of what I had longed to see since my earliest childhood.

Nor was I disappointed. From my pony I could see what appeared to be huge buildings in the far distance, enshrouded in a haze; and it was only after passing through a thick wood of thorn trees and scrub that I realized how close the town was, and how the buildings stood out against the blue sky and the yellow sand of the desert.

It was the Governor's Palace that had attracted most attention; but other well-built offices and houses of solid stone added to the view, and I marveled how such edifices could have sprung up in the desert.

My purpose in coming to Timbuktu,



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THE MARKET PLACE OF TIMBUKTU

In this sun-baked, congested, ill-smelling trading center and African news exchange, five guttural languages may be heard at one time in hot dispute over the price of blue amulets, copper-inlaid saddles, rancid butter, semi-decayed fish, and fly-blown meat.

however, was not to study modern desert architecture, but to see the natives in the same types of houses which have been in use for a thousand years.

### A MOVING PICTURE OF LIFE IN TIMBUKTU

Early the first morning I went up to the flat roof of the Governor's Palace to see the panorama—an indescribably wonderful sight. It was 8 o'clock, and the sun was not yet too high to make things uncomfortable. It shed a warm glow over all the city, causing shadows, reflections, and the sand to harmonize with the general color scheme of the morning.

The first thing to catch the eye was a mosque, a mud dome some 50 feet high, at the far corner of the city, its isolated position making it conspicuous amid the irregular and curiously shaped house tops.

From this point of vantage could be seen a wonderful moving picture of Arabs, Moors, and Tuaregs wandering along the narrow streets; camels with riders, camels with loads, and donkeys with packs; pedestrians shuffling along with their sandals clattering against their heels; and here and there the red fez cap of a French tirailleur. From the market place rose the shrill voices of women and boys calling out their wares.

It was now getting very warm, and at the invitation of one of the French officers I went to his house near the North Fort. It was a charming place, built of mud in true Arabic style, with doors and windows similar to those in Morocco, and divans and cushions much in evidence.

In the evening came a visit to the market and the famous old mosque. I saw the site of the former slave market, and also the present-day settlement of the freed slaves.

Deep sand lay everywhere and roads or paths do not exist.

At 7 o'clock I dined on the roof of a house in the South Fort. It was one of those still African nights, with a bright moon. The chanting of the Arab dancers could be heard in the distance, and the steady beat of the tom-tom went on all night. The air was cool and fresh, but the night was never quiet, as is usually the case in Africa.

The next day was very different in appearance. A brisk wind had sprung

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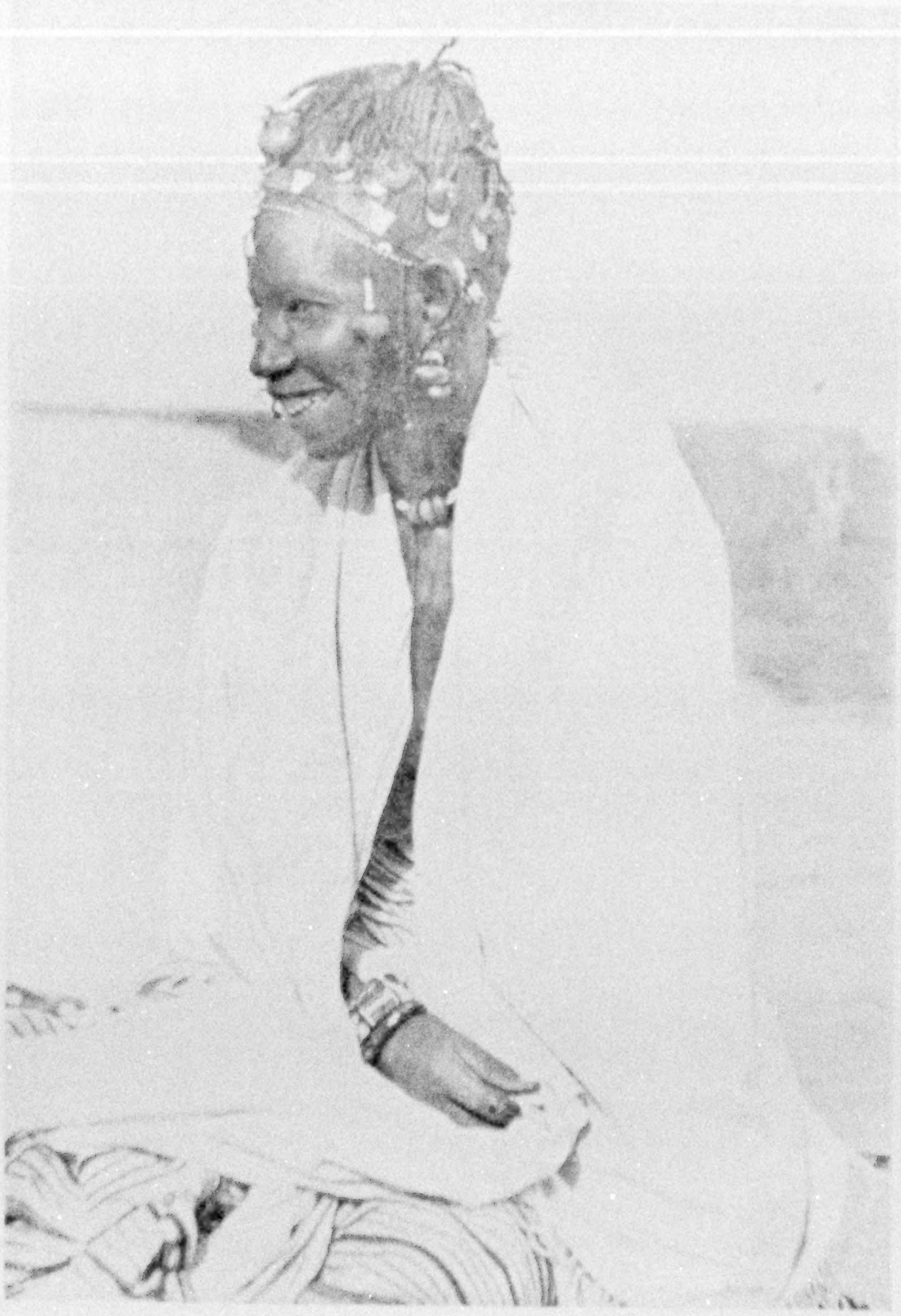
up during the night, and it was impossible to see half a mile from my veranda, owing to the fine sand, which hung over the desert and city like a mantle of fog. Quantities of it blew into the house.



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HEADDRESS OF A NATIVE OF TIMBUKTU

The beads and copper disks are brought by caravan from northern Africa. When traveling in the desert, the native also wears a blue veil, or *litham*, over his nose and mouth. This prevents him from being smothered by the flying clouds of sand and also reduces thirst to a great extent.

### MOHAMMEDAN HOSPITALITY TO A CHRISTIAN

The principal event of the morning was a visit to the chief Marabout, or priest, to whose home an officer acted as guide.

The Marabout was sitting on a mat outside his house. He was a kindly old man of some 60 Timbuktu seasons, clothed in a long, flowing white gown and a turban. His face was intelligent, and as soon as he found I spoke Arabic he beamed with delight, a thing these staid old Mohammedan men rarely do.

He took us into his hall, a sort of porch, and offered us tea, a favorite beverage of the natives, who drink it "neat" out of a glass. As a rule, the tea is as dark as stout in color and made very sweet with sugar. We politely refused a glass, but smoked a good cigarette which his boy brought us. He himself did not smoke, however.

Strange to say, I saw little or no coffee used by the natives in French West Africa.

The Marabout told me I was the first Englishman he had ever spoken to and was pleased to meet a friend of the French, of whom he had a very high opinion. He asked what I thought of his native town. When I told him I had often read about Timbuktu, he seemed pleased at the idea of his town being known throughout the world, and started to tell how big it was when he was a boy, and how still bigger it was in his father's time.

To-day Timbuktu has scarcely more than 8,000 inhabitants, and many of these are nomads who pass through with cattle or engage in the great salt trade from the Central Sahara.

Knowing how cordially all Mohammedans hate the Christians and how they dislike being seen talking to them, we said "au revoir" when the conversation began to flag. We also gave the usual hand shake, which consists of holding the

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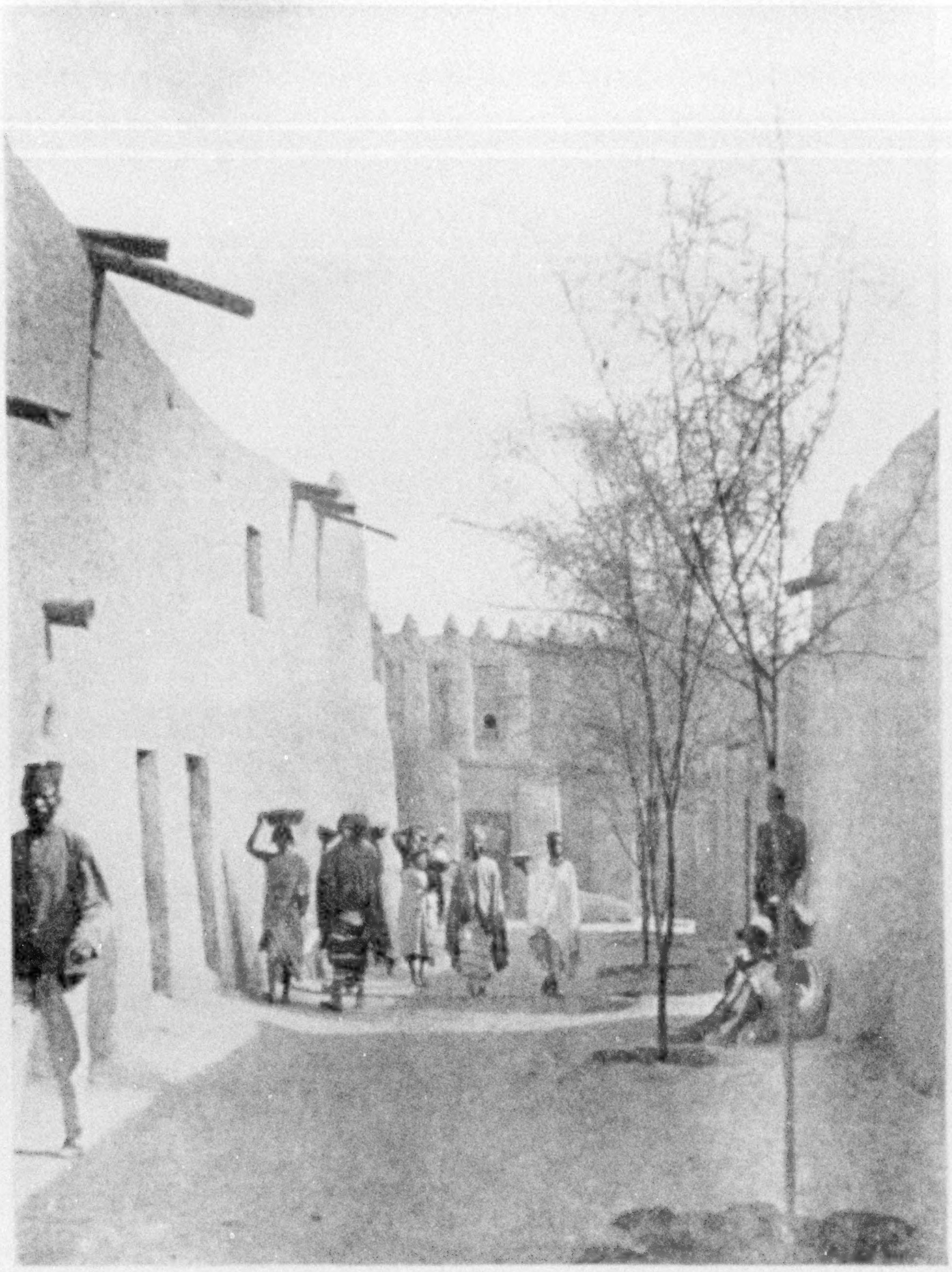

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A STREET IN TIMBUKTU

Life in Timbuktu passes like a slow moving picture through the narrow, tortuous windings of its sand-carpeted thoroughfares. Arabs and Moors in flowing garments, French tirailleurs with gay red fezzes, Fulanis and Tuaregs with sandals clattering at their heels mingle in noisy and picturesque confusion.

man's hand perfectly still for several seconds.

The market place was now becoming congested and the strange-smelling atmosphere was annoying. Meat, covered with flies innumerable, and all sorts of articles of food were being sold. Four or five languages were distinguishable at times, the guttural sounds of the Tuareg being predominant. The noon sun was blazing hot, but a sun-umbrella afforded some relief.

The natives sat on mats, under the shelter of little grass shanties. All sorts of trades were represented: butcher, saddler, leather-worker, grocer, jeweler, perfumer, barber, blacksmith, tailor, and last, but not least, the fishmonger.

There is a big trade in dried fish caught in the Niger, and, since the native is very fond of fish, it is readily understood how a "sun-dried-fish merchant" soon sells out.

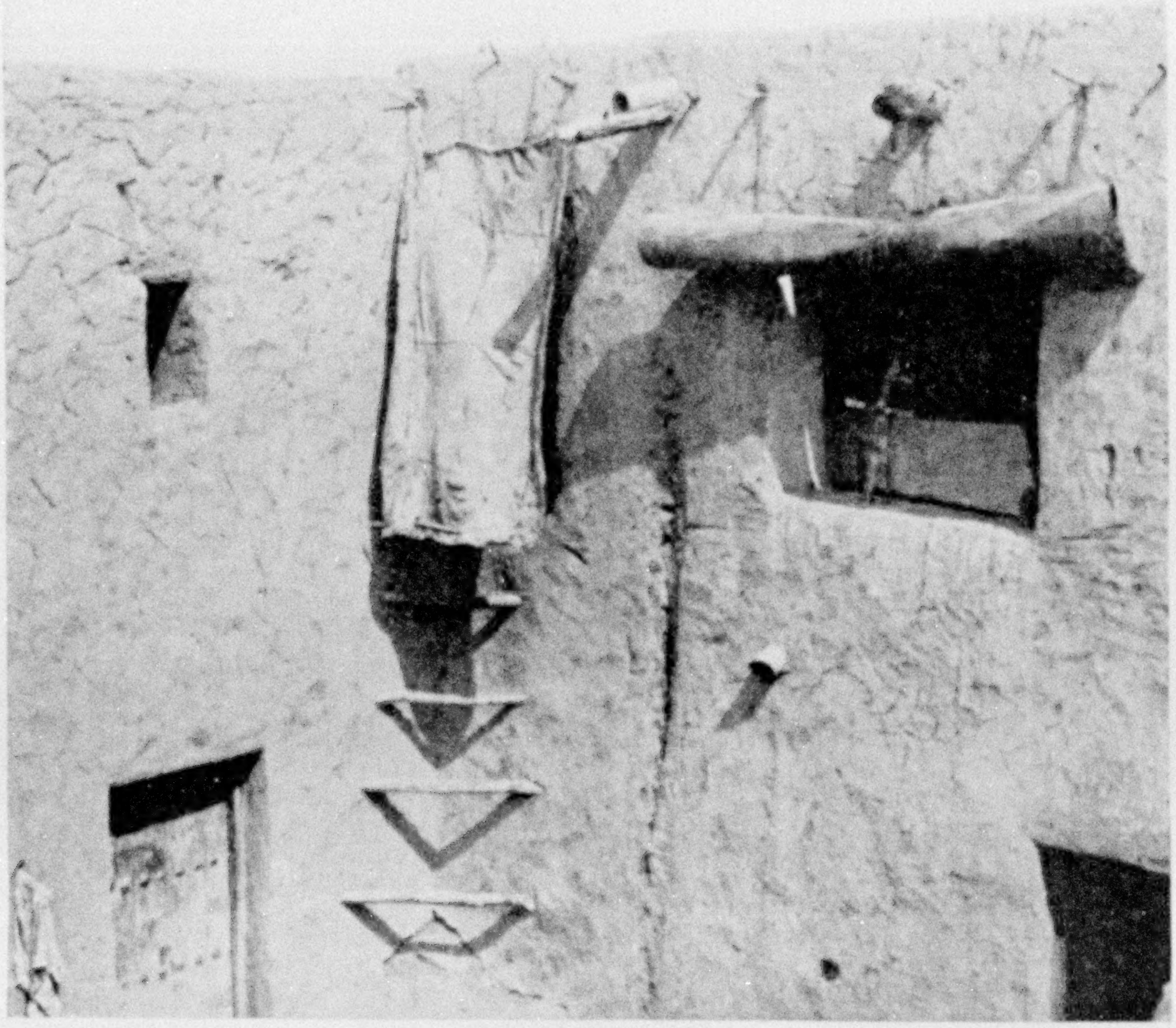
I bought some pretty blue amulets and necklaces as curios, and was pestered by an ex-soldier who spoke a little French to buy some of his cigarettes. I did, but soon after I lit one I discovered my error!

In the market place are three European commercial houses where the ordinary necessaries of life can be bought at exorbitant prices. I remember asking the price of a bottle of white wine and was told 55 francs!

After leaving the market place we came to a large hollow in the ground that was for many years the home of an old hippopotamus which had become tame and had lived there much as a pig wallows about a farmyard.

### ALL WOMEN SEEN IN STREETS BELONG TO SERVANT CLASS

The streets, or rather passages, were full of people, either going to or returning from the market, which is a sort of African news exchange. The "Anglais" seemed to be an absorbing topic of conversation and curiosity. Arab boys and girls ran past one like fleet little gazelles, while men in passing saluted by raising the hand; the women either turned and ran or passed in a very bashful manner.



Photograph by Agence Economique du Gouvernement Général de l'Afrique Occidentale Française

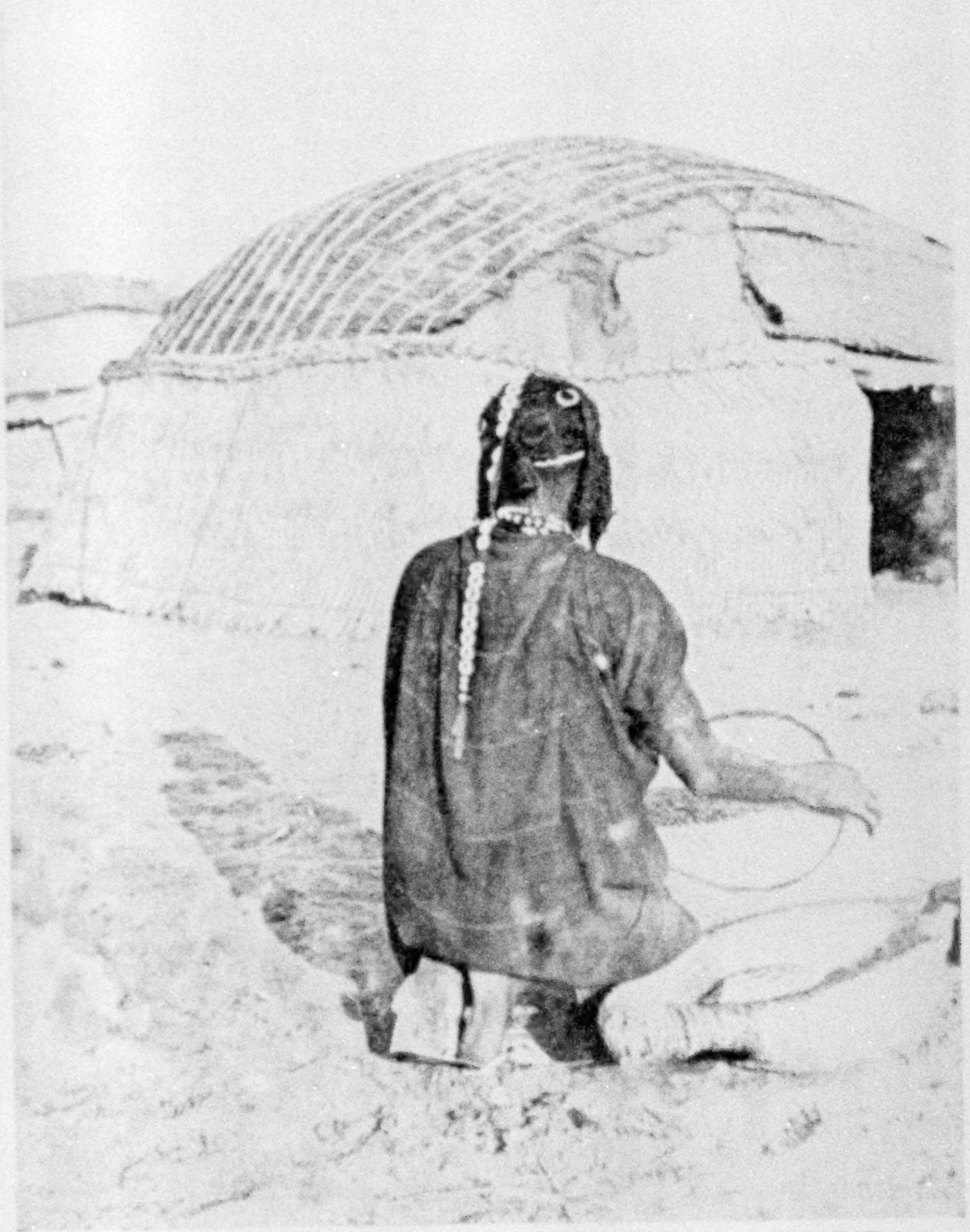
THE CORNER OF A COURTYARD IN TIMBUKTU

Native houses in Timbuktu are somber-hued, two-story affairs of Moorish design. They are built of sun-dried bricks made of the clay found under the sandy wastes of the surrounding desert. They are usually cool and comfortable, except when high winds befog the air with sand particles and drive sand through windows and doorways into every nook and crevice of house and courtyard. There is an outer and inner courtyard—one for the men, the other for the women.

These women, of course, were only the servants of the wealthy Arabs and Moors; the rich native woman never leaves her house from one year's end to another, unless to travel with her man. She is then veiled completely, and it is difficult to tell whether a male or female is perched on the top of a camel.

The Tuareg women and girls do most of the household work for the richer and more educated natives. The girls are most attractive in appearance, but very dirty. They never wash, as their home is usually in the heart of the desert, where the limited supply of water is reserved for drinking purposes and is kept in the water-bags, slung on the backs of camels and oxen.

The Tuareg is of a light coffee hue, while Arabs are often far lighter in color



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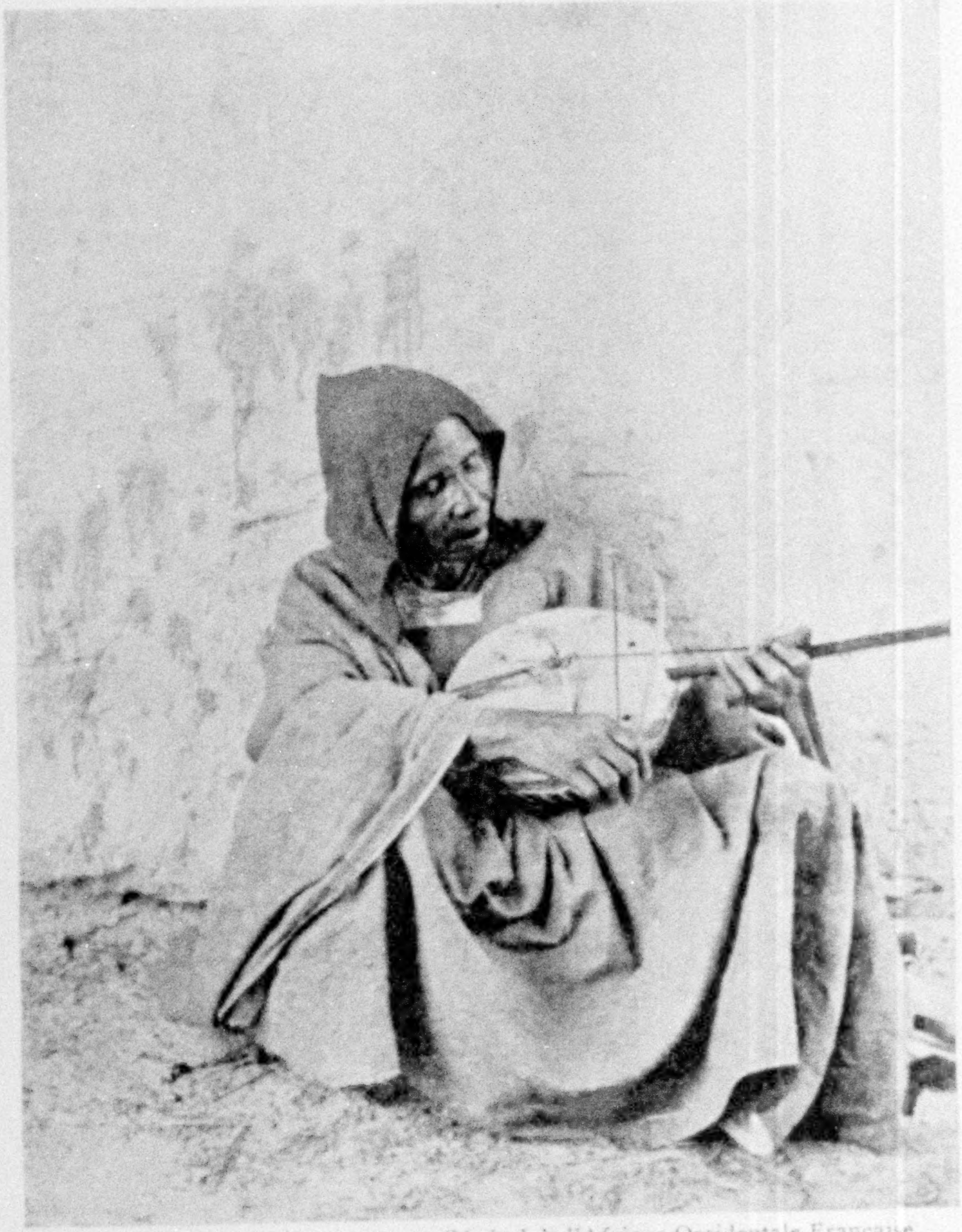
A TUAREG WOMAN SIFTING FLOUR

The Tuaregs are warlike nomad Berbers, who roam the desert with their sheep and goats. From time to time they visit Timbuktu to barter an animal for some rice, millet, or wheat. All menial work is done by negro slaves, called beylas. Tuaregs live in encampments, in tents made of goatskins or temporary shelters constructed from mimosa scrub and palm leaves.



Photograph by Gouvernement Général de l'Afrique Occidentale Française

A MUSICAL NATIVE OF TIMBUKTU

After a glass of strong tea, this Moor has settled down with his unusual instrument to mingle its queer notes with the monotonous chants of the Arabs and the beating of the tom-toms. He can produce a variety of sounds by working a tiny bow over one string of camel's hair. The mud wall back of him furnishes some protection from the persistent whirls of blinding, choking sand which prevail in the city.

than a sunburned European. Their eyes, which are very beautiful, belie their jealous and deceitful natures.

Beggars are to be found in all African towns, but I never saw a more pitiable collection than those in "Tombouctou" (as the native calls it). Some were blind, some were cripples, others old and feeble; but all chanted some song or prayer in a monotone, beseeching Allah and the passer-by to give them alms.

As a rule, the native is kind to beggars, but cruel to his animals; donkeys and camels receive rough handling. The usual cure for sore back or girth gall is a green leaf, with a little sand rubbed in.

Little remains of the house of Barth, the great African explorer of the last century. Looking at the ruins, I marveled at the manner in which this famous man must have existed while compelled to stay in the city, long before the French conquered West Africa.

How many changes have been wrought in Timbuktu during the 30 years since Marshal Joffre, then a commandant, made his brilliant march to this city to the relief of the ambushed Bonnier column!

During the rains Timbuktu has a large paddle-boat of some 200 tons; six tall masts of the wireless station can be seen from the city housetops, and the hum of airplane engines coming up from Dakar has been heard.

The telephone and telegraph are likewise in use, the latter being employed by the merchants.

Before the advent of the French, money was little known, barter and exchange serving for all transactions. Cowrie shells are even now used in the market, for silver is scarce and paper money is reluctantly accepted.

### HOW THE TWENTY EUROPEANS OF TIMBUKTU AMUSE THEMSELVES

The European population of Timbuktu now numbers about twenty, chiefly government officials, with three or four merchants. A European baby was born in Timbuktu in 1920—the first one in the history of this old town.

Social life is essential in a desert place like this, and the French do all they can to make themselves happy and comfortable. There is a good hospital and a fine, hard tennis court. Riding and shooting, with tennis, constitute the only forms of exercise. Polo has not found its way there yet, but will sooner or later, I think. That is a game in which natives in many parts of the world soon become expert.

### A TIMBUKTU SAND-STORM

The wind, which made things so uncomfortable in the morning of my first day, became much worse toward sunset, developing finally into a veritable sandstorm.

The city was enveloped in sand. Natives hurried to and fro, with their flowing garments tucked over their heads to keep the sand out; animals turned their tails to the storm, and everybody waited for one of the ten annual showers of rain.

After an hour's extreme discomfort, the rain came, accompanied by vivid flashes of lightning and terrific crashes of thunder. Then, as if by magic, the sand ceased to blow. It greedily absorbed the moisture, and in 20 minutes we were outdoors, inhaling the fragrance of the picturesque little garden in front of the Governor's Palace.

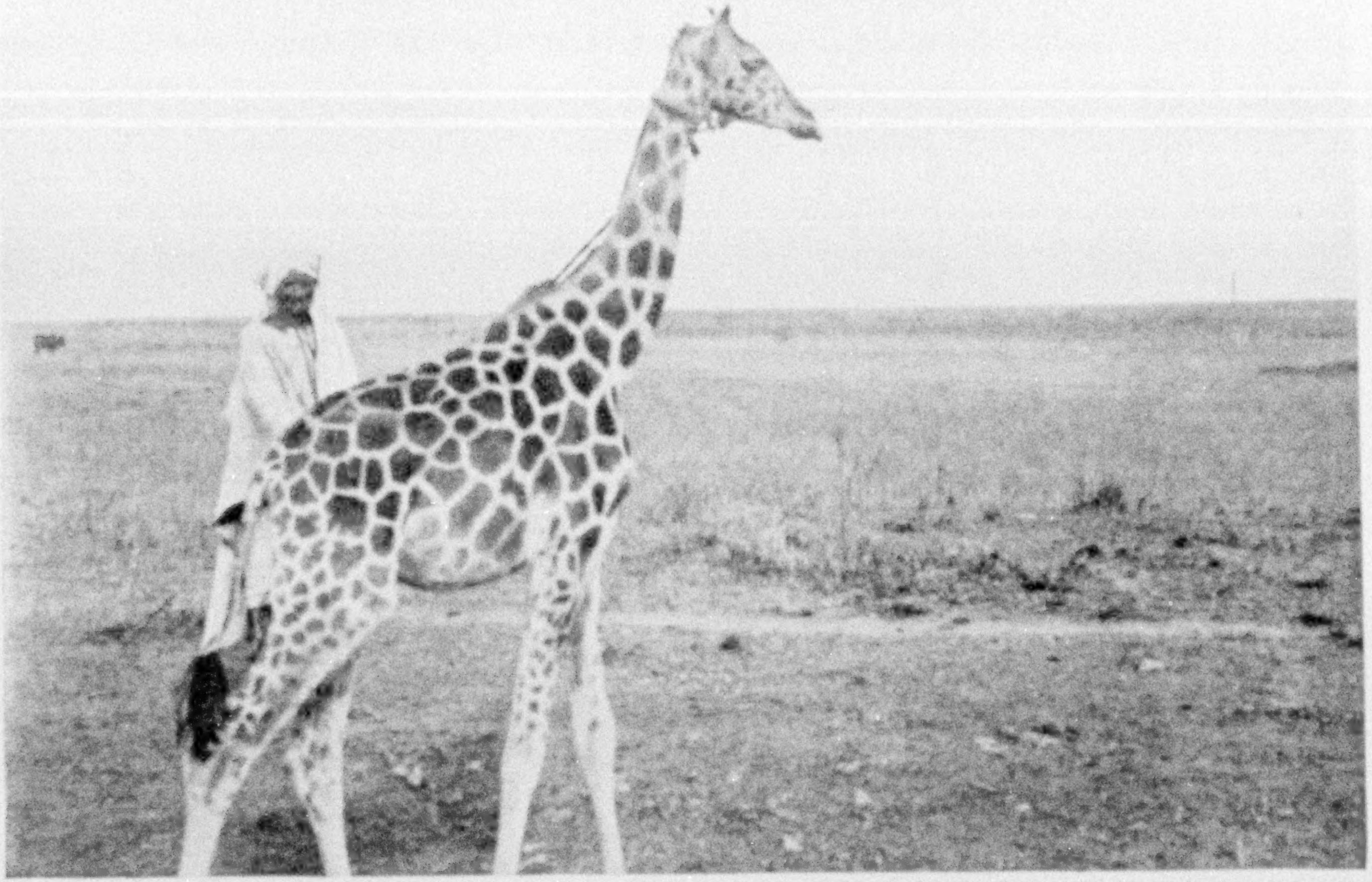
This little garden was most astonishing. Here in the desert was a miniature Kew Gardens, beautifully designed and laid out, and full of the most wonderful exotic plants, trees, and shrubs.

It was quite a labor to make that garden. All the earth was carried up from the Niger banks in panniers on donkeys, and every day, at sunset, the plants were watered by prisoners, who seemed most interested in their task, although they thought the European idiotic to water flowers or trees—Allah would do that when He pleased.

During the evening, while sitting on the veranda with several French officers, my attention was attracted by what appeared to be an exceedingly bright star, near the horizon.

"That," said an officer, "has a curious history. It is a lamp on the top of the Palais de Justice and is lit every evening at sunset by the police.

"Some years ago we had an energetic police officer here, and he wished to have the town lighted at night by oil lamps, partly to help strangers find their way and partly to help the police recognize



Photograph by Agence Economique du Gouvernement Général de l'Afrique Occidentale Française

A YOUNG GIRAFFE AND ITS CAPTOR

A giraffe family rarely has more than one baby. They feed on mimosa leaves during the day and come down at night to the Niger River to drink. Their curious mottled coat blends perfectly with the sandy background of their desert home. The natives slaughter thousands annually and make the skins into purses and sandals.

strangers who might be wanted for theft or murder. In due time the lamps came from France, but, to his great disappointment, there were only four!

"Naturally, so few were useless for the purpose originally intended, and so a new use had to be devised. Three eventually found their way into various government buildings, and the fourth you see before you, on the top of the Palais de Justice. On a clear night it can be seen for miles and miles out on the desert. It serves as a guide to all men who are late returning, or who are lost at night outside the city."

During this conversation boys had brought a rare collection of syrups, bitter and sweet drinks, and cigarettes, the latter being in an uncommon box made from a block of salt. It was rather the color of rock salt, but clear as crystal and very heavy. These boxes would realize a fortune in Europe, but they never get so far, as they break and crumble in a moist atmosphere.

The Arabs sell the boxes for a mere song, usually bringing them to the city when the great salt caravan arrives annually from the heart of the desert, some 300 miles north of Timbuktu.

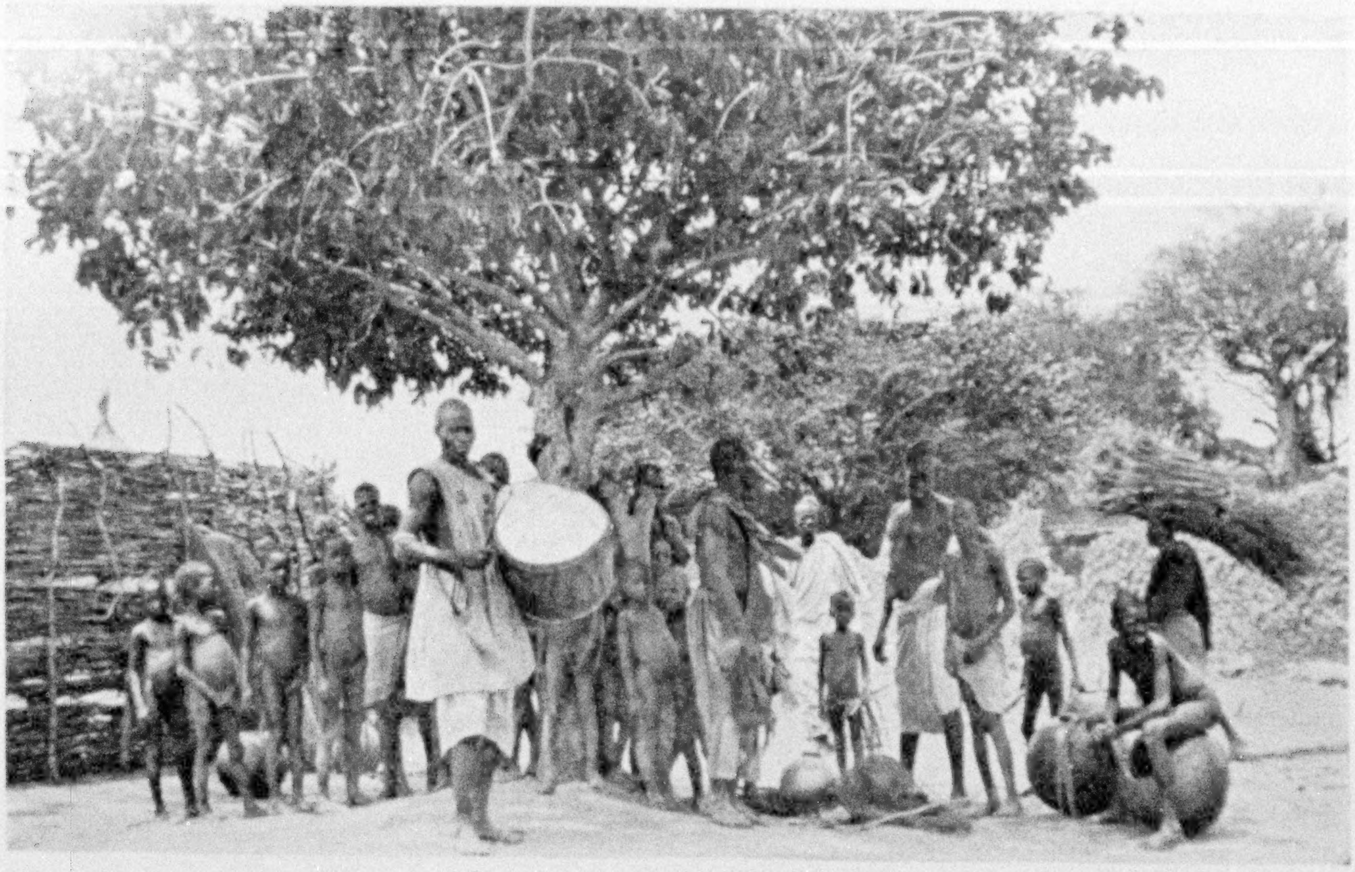
### YEARLY VISIT OF SALT CARAVAN CHIEF EVENT IN TIMBUKTU

The French Government protects the salt caravan by sending out 200 camel corps men with Europeans in charge.

This strong escort defends this wonderful caravan from the ever-threatening attacks of the marauding Tuaregs and desert tribes.

When the caravan enters Timbuktu a great welcome is given the travelers, and the whole town is *en fête* for several days. The big chiefs from the surrounding districts pay their homage to the commander, and thousands of natives come in to buy their annual supply of salt.

The coming of the caravan is a marvelous sight—some 800 camels laden with salt and hundreds of others ridden by gorgeously robed chiefs, with their various



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SUMMONING A FISHING PARTY AT KABARA, ON THE NIGER, THE PORT OF TIMBUKTU

"Goin' fishin'" is not a sport, but an important industry, in the mud village of Kabara. The drum is a hollow log covered with a taut goatskin. It is used all over Africa to call meetings or to send messages to other towns, its sound being audible for many miles.

bodyguards, either mounted or on foot. The caravan returns north with rice and grain, brought up by canoe from the large agricultural districts of Gundam, El-Waleji, and Gao.

### MOSQUITOES A RARITY IN TIMBUKTU

Another day dawns, with a cloudless sky and a cooler feeling in the air, owing to the rain of yesterday, but to last only for a few hours. At noon the fierce sun has made one forget that there ever was a rainfall; the sand has become as dry as a bone, and millions of flies torment man and beast until sunset. Then, in many parts of Africa, the mosquito appears.

Not so in Timbuktu, however. Here this winged pest is a rarity and, if seen, it is given, by way of a joke, a name, such as "Henri" or "Jacques"!

Owing to the scarcity of mosquitoes, there is little or no malaria in Timbuktu, and Europeans can stay there three or four years, enjoying far better health, in many cases, than if they were in France or England. Several residents of the city told me they never found it necessary to take quinine.

Natives suffer a good deal from pneumonia—not so much in the cold season, from December to February, but later on in the year, when the rains come and the weather is treacherous. They are usually so poor that they cannot afford blankets and wood is scarce and expensive. So they simply have to sleep in their rain-soaked clothes.

### NATIVE CANOES SKILLFULLY CONSTRUCTED

For exercise, one morning I borrowed a pony for a ride. At the appointed hour a lovely white Arab was awaiting me, with a Fulani boy as groom.

We rode off to the south in the direction of Kabara. It was a pretty ride, but heavy going in the deep sand.

At this little village I was shown around the "harbor," and became interested in the number of native canoes and dug-outs which were being prepared for the time when the river would rise. This event makes little Kabara famous for six months in the year.

Some of the canoes were 50 feet long, skillfully made from two trees. The bulk of the wood of one trunk is chipped

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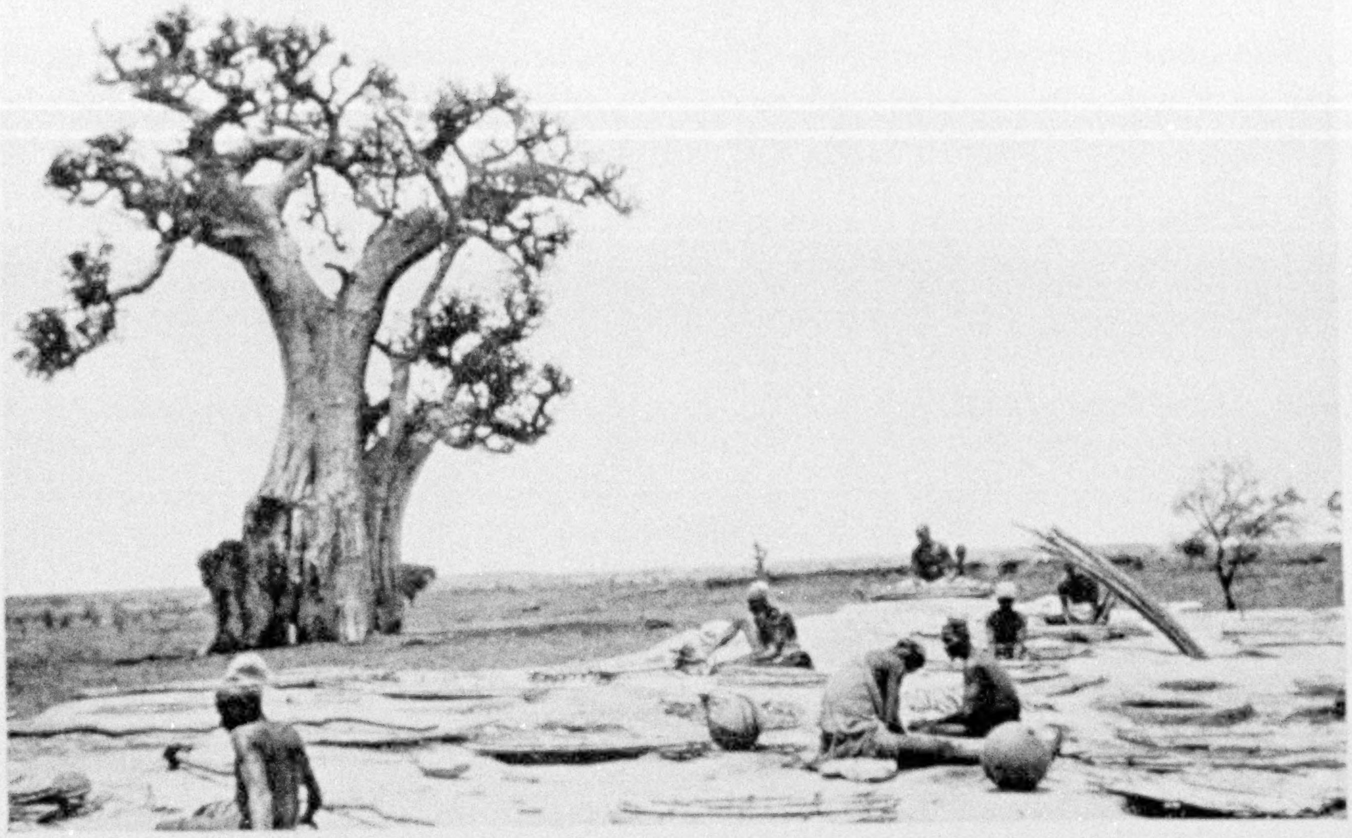
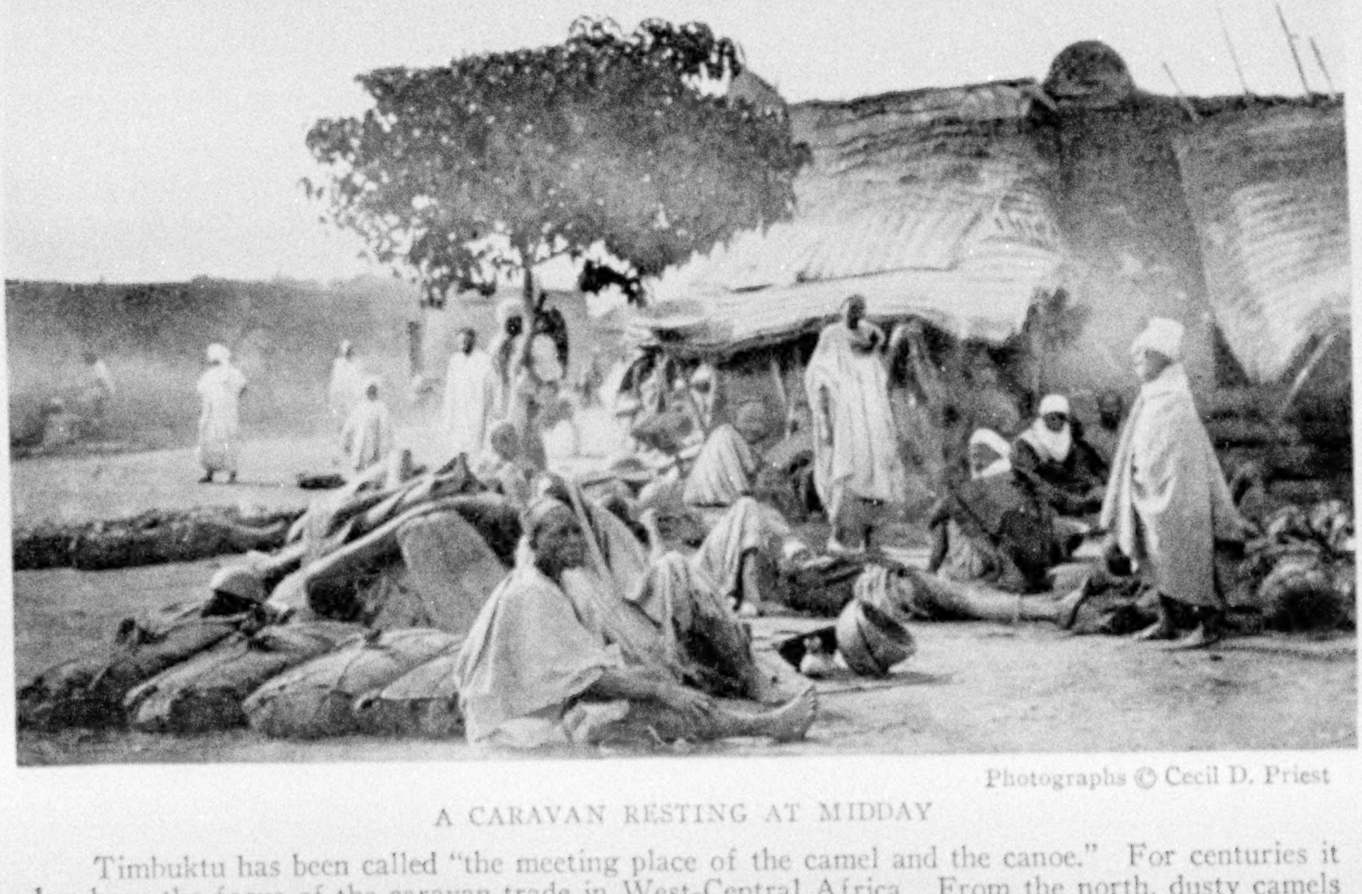


DYE PITS AT JEGA, DISTRICT OF SOKOTO, NORTHERN NIGERIA

Dye pits are found in many towns of northern Nigeria. Both cloths and skins are dipped into circular vats sunk into the ground, and after being dried are beaten over a log. Skins are colored deep red or orange with native dyes. Roots, leaves, and barks are used in the various processes through which the raw hide passes. The finished skin is often very beautiful and as soft as Russian leather.



Photographs © Cecil D. Priest

A CARAVAN RESTING AT MIDDAY

Timbuktu has been called "the meeting place of the camel and the canoe." For centuries it has been the focus of the caravan trade in West-Central Africa. From the north, dusty camels lurch across the Sahara, laden with salt, hardware, beads, sugar, dates, leather, and cheap fabrics. From the south the canoes bring cereals, gold, wax, ostrich feathers, ivory, gums, and rubber.

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away, leaving a shell which when shaped is joined to the other tree by strong ropes.

Other boats were fashioned out of rudely cut planks, either laced together with cord or kept in place by iron fasteners. Each canoe had a shelter in the center (see page 85).

The boats are operated by four or five men with long bamboo poles, who stand in the bow or stern, as occasion requires. Sails on these craft are dangerous and are not often used.

The fishing season was in full swing, owing to the low stage of the river, and quantities of nets were drying, while the air was heavy with the odor of fish. Small areas were netted and the results were extraordinary—very often 1,500 to 2,000 pounds of fish were caught at one haul.

A detachment of the Senegalese regiment is stationed here. The guard turned out at the approach of their captain and saluted in a thoroughly soldierly way. Some had medals and many were veterans of the critical struggle at Verdun.

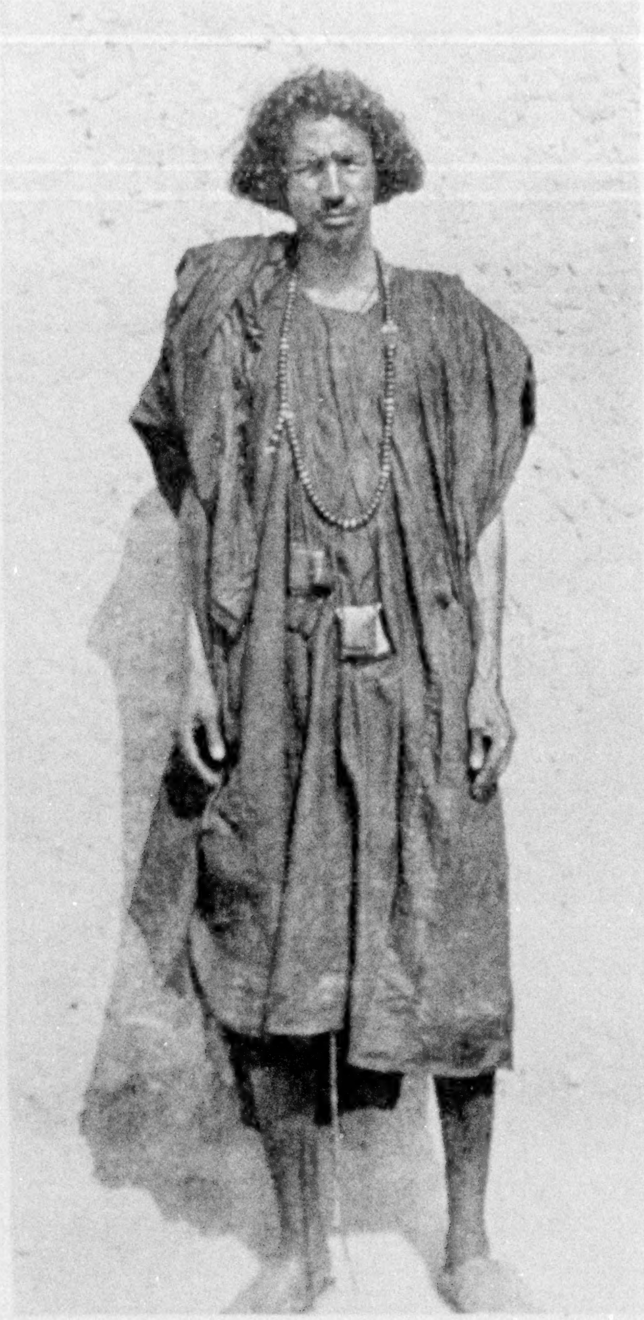
On our way back we passed many flocks of sheep and herds of goats which were being driven down to the river to drink. The poor animals were so lean and underfed that it was a wonder how they crawled along. But thirst and the shrill bark of the cattle boy's "pie-dog" urged them on in spite of tormenting flies.

### ATTRACTIVE HOUSES MADE OF MUD

I had luncheon with the post physician in his delightfully cool house made of mud. He had had it painted inside with a wash of "Burem earth," a kind of natural distemper found in the bed of the river Niger at Burem.

In the rooms and halls were many trophies of the chase, the best being a magnificent white oryx head with antlers of remarkable size. There was also a huge crocodile skin some 20 feet in length, and the sun-bleached skull of a hippo reposed outside his front door.

All curtains were of native cloth, with pretty designs embroidered by the tailor-man at the hem. Cushions of leather, neatly carved by the leather-worker, were on chairs and divans, and in some cases they were interlaced with colored strips of the same material, making an oriental pattern.



© Cecil D. Priest

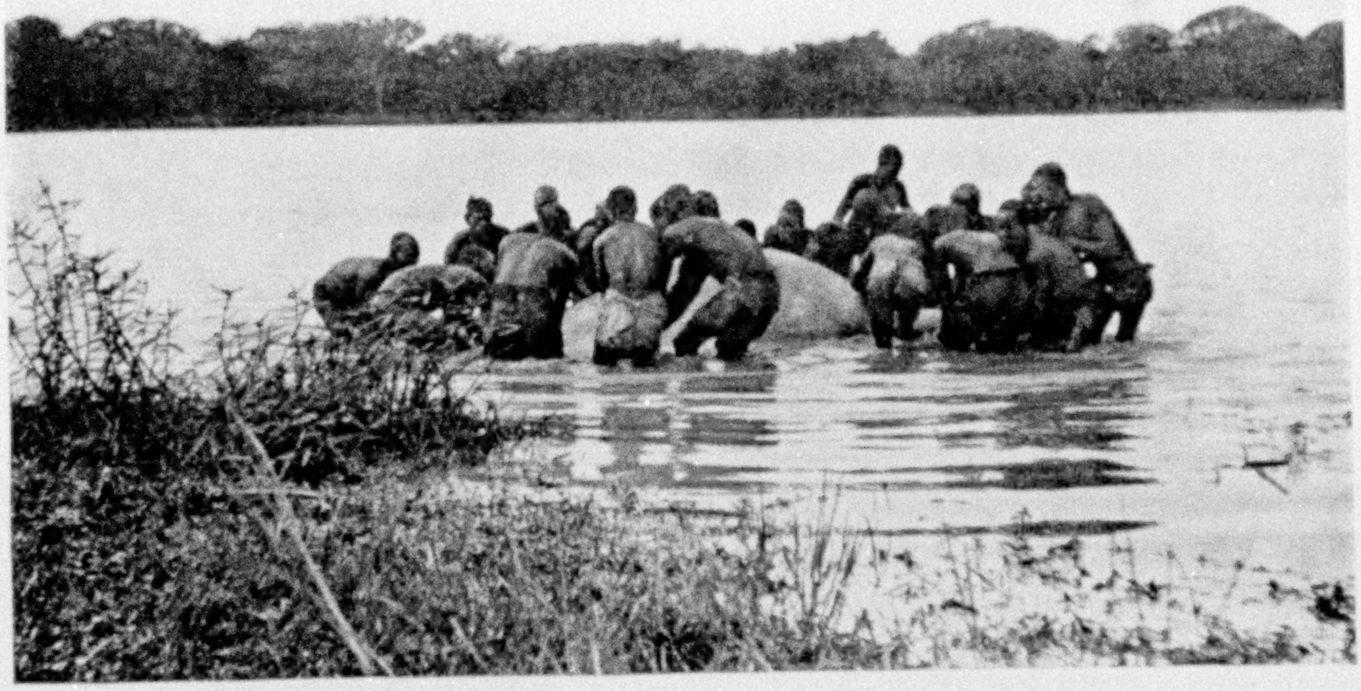
A MOOR OF TIMBUKTU

The great trading class of northern Nigeria is composed primarily of Moors. They are reputed to be both wily and clever.

This leather-work is really lovely and is quite a fine art among the Tuaregs.

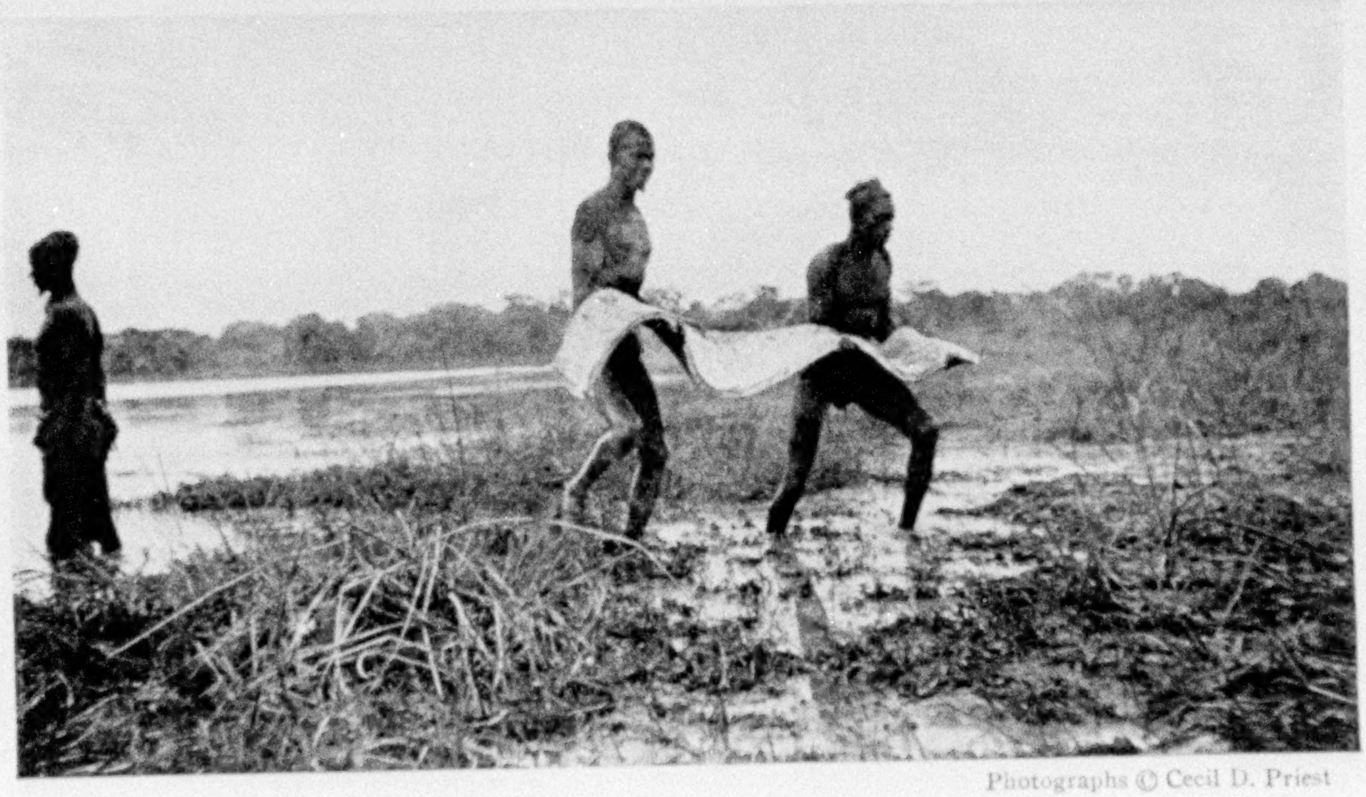
### SPEARS AND SHIELDS CLEVERLY ORNAMENTED

The native takes great pains with his "hold-all," his substitute for the European box or suitcase. It is very elaborate and often from three to six months are spent in completing it. Fringes of lace hang down for about 18 inches at each end and the opening is laced up like a pair of boots. The nomad's clothes,



SLAIN HIPPOPOTAMUS BEING DRAGGED TO SHORE BY 22 NATIVES

A hippopotamus is generally inoffensive when undisturbed, but capable of surprising bursts of speed and ferocity when aroused. A quick and powerful swimmer, this animal will charge a canoe, overturn it, and crunch it in its powerful jaws. Here and there among the rushes of the Niger are hippopotamus pools, where the unwieldy "river horses" come singly or in herds to feed and bathe.



Photographs © Cecil D. Priest

A LUSCIOUS STRIP OF HIPPO HIDE

The skin of the hippopotamus is very tough and sometimes two inches thick. The natives boil it for food, but a patient application of the fletcherizing process is always necessary. Hippopotamus teeth are highly prized as ornaments, being harder than ivory and less liable to turn yellow.

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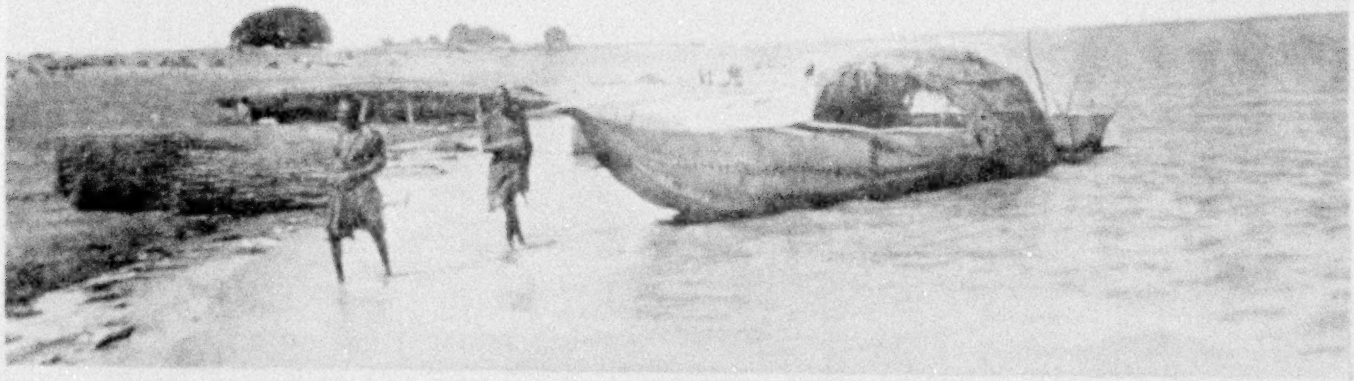

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A NATIVE CANOE ON THE NIGER

Nigerians are expert in making canoes out of hollow logs and pieces of dum palm. The larger canoes are fastened together with palm leaf rope or wooden pegs. Their owners ply for miles up and down the Niger, trading in dried fish and cereals. A grass awning shelters them from the blistering sun.

food, and household goods are all jumbled together inside.

On the walls of the physician's house were heavy iron spears, five or six feet long, with beaten brass and copper inlay.

The mounted Tuareg usually bears one of these spears and a shield made of ox hide and nicely carved. More elaborate shields are made from oryx or giraffe hide. These are most serviceable and will resist with ease a sword cut or arrow.

Another article of local manufacture which attracted my attention was a bit, a cruel device consisting of a sharp piece of iron projecting from the bar and designed to be placed under the horse's tongue.

With this bit and spurs, the native is able to make his horse "tripple," regarded by them as the essence of good breeding in a pony. He can also draw the animal up on its haunches from a full gallop within a space of 20 feet—very pretty to watch, but distressing when one realizes the cruelty practiced to accomplish the feat (see also text, page 69).

After luncheon I tasted a new and most refreshing drink called citronelle, a kind of tea made from a grass which the French cultivate in their gardens.

Other wonderful things are also grown along the banks of the Niger at these French posts. I saw melons, strawberries, pineapples, bananas, limes, egg-fruit, pomegranates, and vegetables of every kind.

When the time came for my departure, I rode one cool evening to Korviamo by moonlight, with an escort of four mounted soldiers. Even in these days it is not safe for Europeans to wander about the desert alone, for the "Razuls," or bandits, will still kill or capture if they get the chance.

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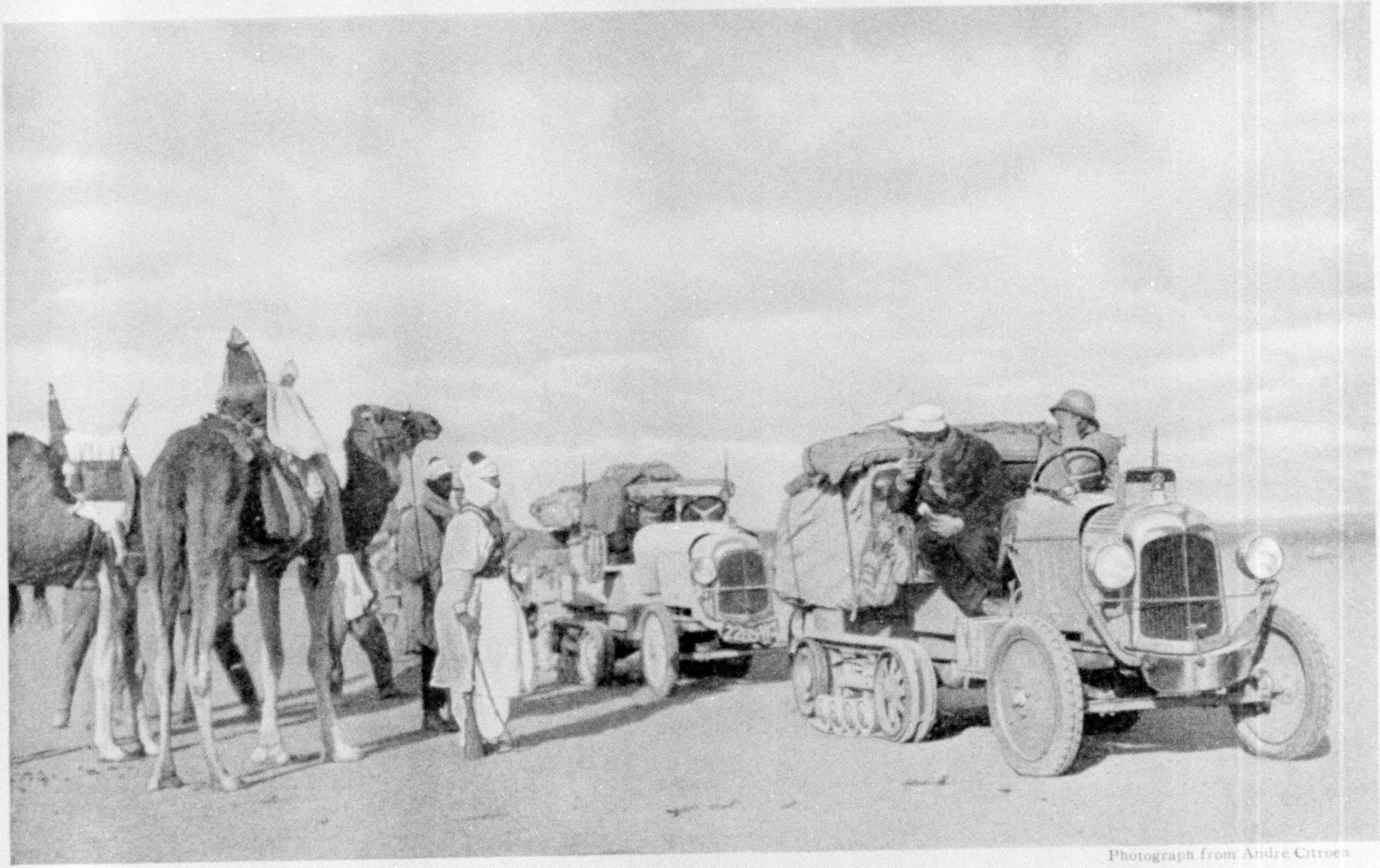
**INDEX FOR JULY-DECEMBER, 1923, VOLUME READY**

**Index for Volume XLIV (July-December, 1923) of the National Geographic Magazine will be mailed to members upon request.**



Photograph from André Citroen

A MEHARIST AND HIS CAMEL LOOK WITH AWE UPON THE NEW SHIP OF THE DESERT

The meharist is an efficient Arab police-soldier of the desert. His mount, the mehara, is a camel especially selected for its speed and is not used in ordinary desert transport. Note the rollers and the bands of canvas and rubber supplying greater traction surface for the motor cars (see text, page 87).

# THE CONQUEST OF THE SAHARA BY THE AUTOMOBILE

THE camel no longer holds his own on Sahara sands. Five man-made, mechanical contraptions have defeated him on his own grounds, by reducing to a paltry 20 days the three months' time he usually requires for a 2,000-mile trip across the desert.

The Citroen caterpillar tractor expedition across the Sahara from southern Algeria to Timbuktu and the Niger, in December, 1922, and January, 1923, not only added a worthy page to the history of French exploration in Africa, but also gave impetus to the long-cherished desire of the French to effect a political and commercial liaison between the northern and western colonies of their vast African empire (see map, page 46).

Since the political entry of the French into North Africa at Algiers, in 1830, their control has been gradually extended farther into the desert by the establishment of posts in the principal oases. The central plateau region, however, has been difficult to manage, and the success of the Citroen expedition is regarded as an important step in opening up this key region to the great desert and in the control of its important north-to-south caravan routes.

A railway will doubtless come to cross the Sahara in due time. Meanwhile its quick and trusty advance courier, the automobile, goes before to discover more of the secrets of the mighty unexplored spaces of the mysterious desert.

There is much that we think we know, but more that we do *not* know about the Great Sahara Desert. There is, to be sure, sand a-plenty in the northern stretch and toward Egypt to the east, but there is a vast region of varied surface and irregular relief, containing rocky plateaus, tracts of loose stones and pebbles, mountain ranges, gorges, and valleys, about which our information is decidedly nebulous. In some sections the desert lies 100 feet below sea-level; in others it rises from 5,000 to 8,000 feet.

Rolling, shifting sand dunes constitute only one-ninth or one-tenth of the Sahara's entire area. South of Algeria they give way to a rugged, rocky region, which is displaced in its turn by vast plateaus of massive black rocks, boulders, and pebbles. Beyond, 900 miles from the coast, lie the lofty crags of the Hoggar Plateau, with peaks 8,000 feet or more in height.

### ROLLERS AND CANVAS BELTS SUPPLANTED WHEELS

The Citroen caterpillar tractors were especially designed, after many tests, to operate successfully over this varied and difficult terrain. They had to conquer slipping, clogging sands and sharp, piercing stones.

The most interesting feature of their construction was in the rear, where wheels gave way to rollers. These were covered with a continuous band of rubber and canvas, which made a tough and supple rail on which the car could travel. This increased the traction surface and also obviated the danger of the car's sinking into the sand (see page 86).

Before the start from southern Algeria, two auxiliary parties were sent out, one from Tuggurt and one from Timbuktu, to establish oil and supply depots within some 625 miles from each point.

In spite of sand-drifts, boulders, gullies, waterless stretches, a sandstorm, broiling suns by day and icy temperatures by night, the expedition averaged 100 miles a day.

Tuggurt, the sand-locked terminus of the South Algerian Railway in southern Algeria, was the starting point for the adventure. The convoy covered the first 125 miles of its itinerary, across the sands to Wargla, without difficulty. From this famous date-growing region it followed the big, dried-up waterway of the Wadi Mia Valley, amid dunes, to Fort Hassi Inifel, some 250 miles farther south. This small station is lost in the sandy masses of the Great Eastern Erg (erg meaning sand hill), which stretches almost uninterruptedly from Morocco on the west to Tripoli on the east.

After Inifel the aspect of the desert begins to change from sandy plains, with stretches of bluish and gilded dunes, to a desolate, gloomy country strewn with

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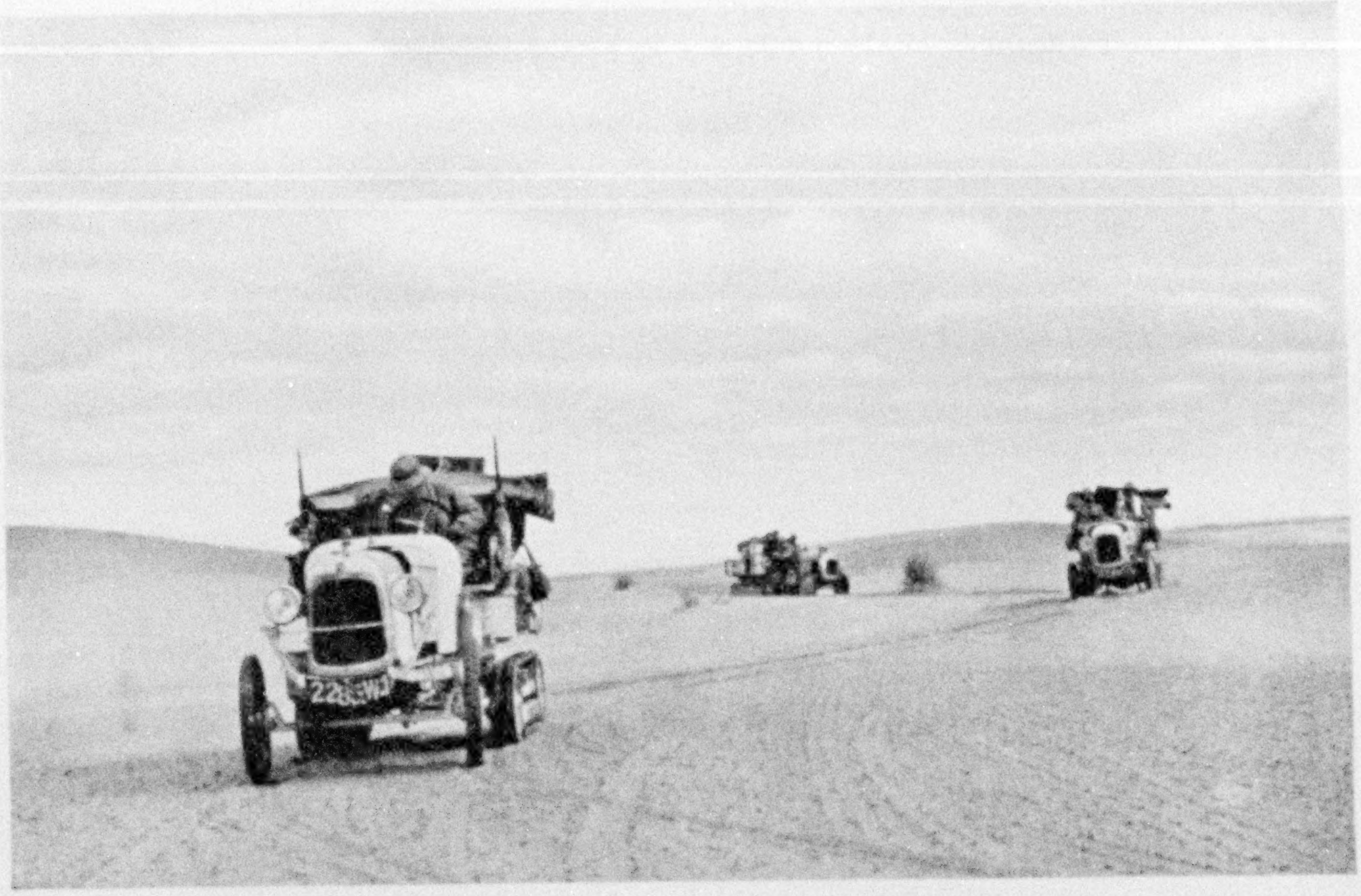
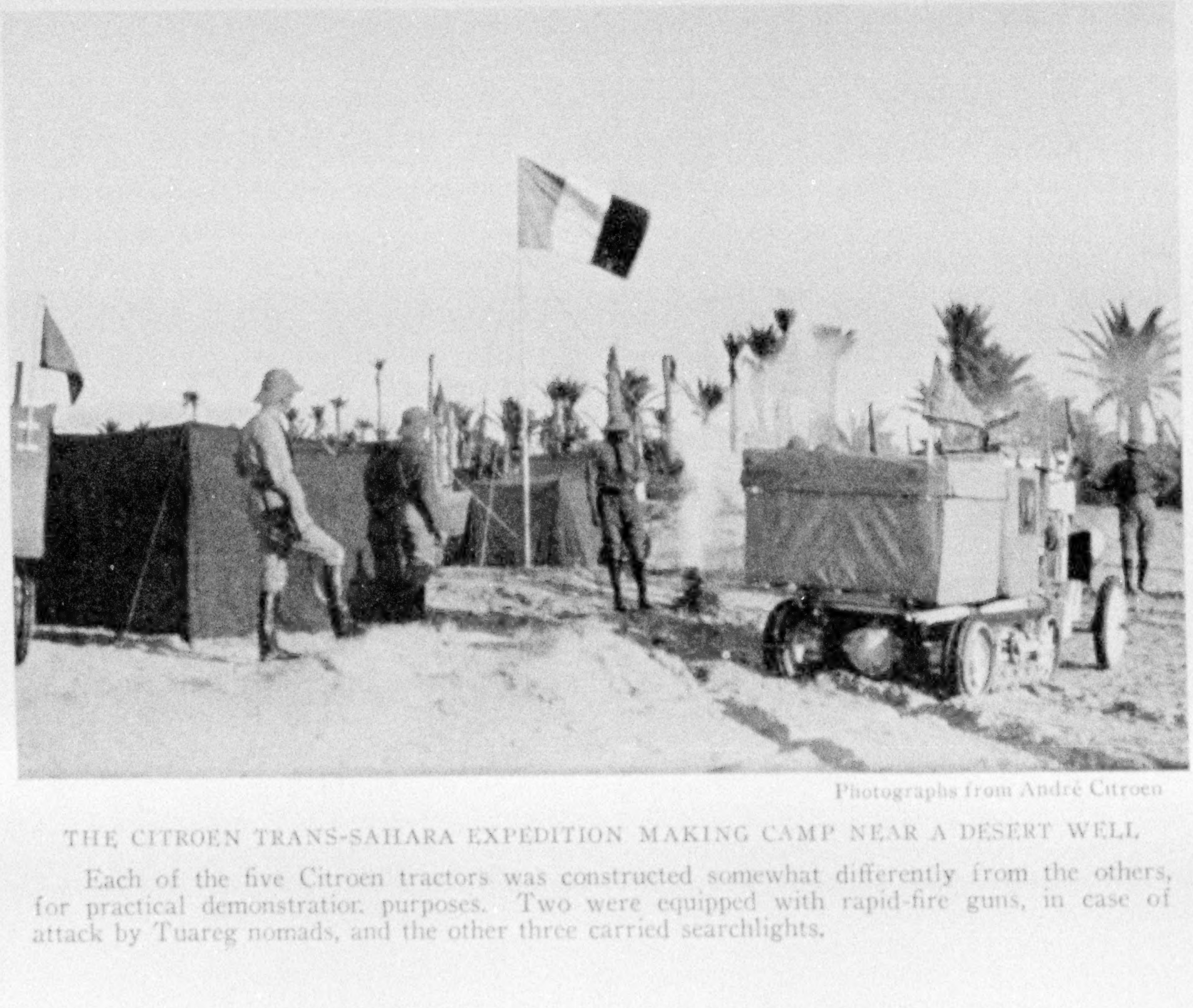


IN THE SAND-DRIFTS NEAR INIFEL, ALGERIA

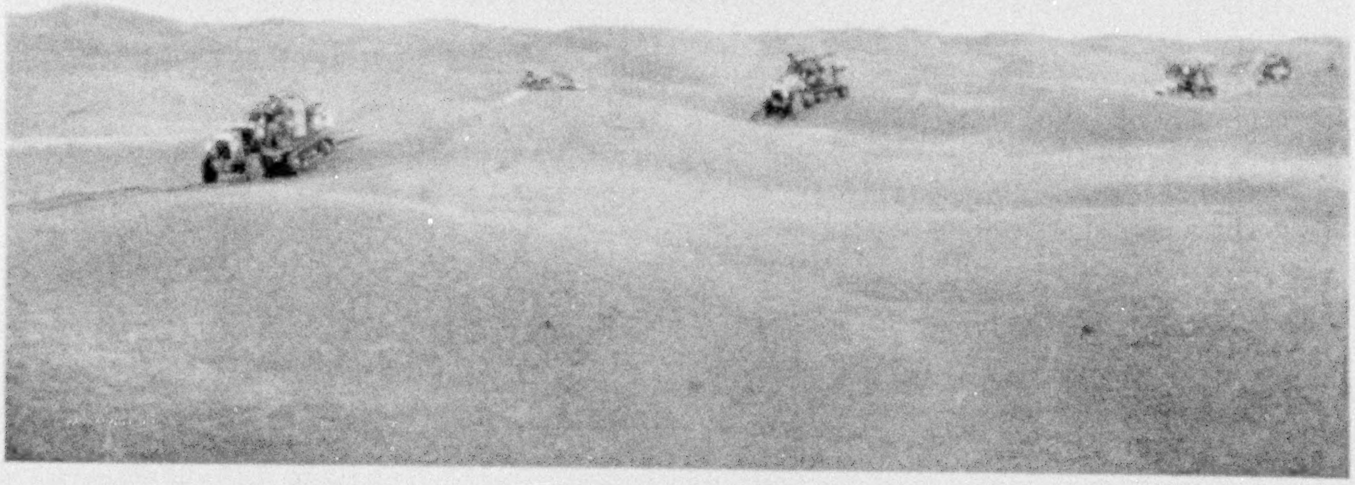
The area of the entire Sahara has been estimated as more than 3,400,000 square miles—almost as large as all of Europe. The desolate sand dunes along the northern edge, 100 miles from the Mediterranean coast, and the fanatical nomads of the interior long prevented fuller knowledge of the peoples and places of the center of the great desert.



Photographs from André Citroen

THE CITROEN TRANS-SAHARA EXPEDITION MAKING CAMP NEAR A DESERT WELL

Each of the five Citroen tractors was constructed somewhat differently from the others, for practical demonstration purposes. Two were equipped with rapid-fire guns, in case of attack by Tuareg nomads, and the other three carried searchlights.



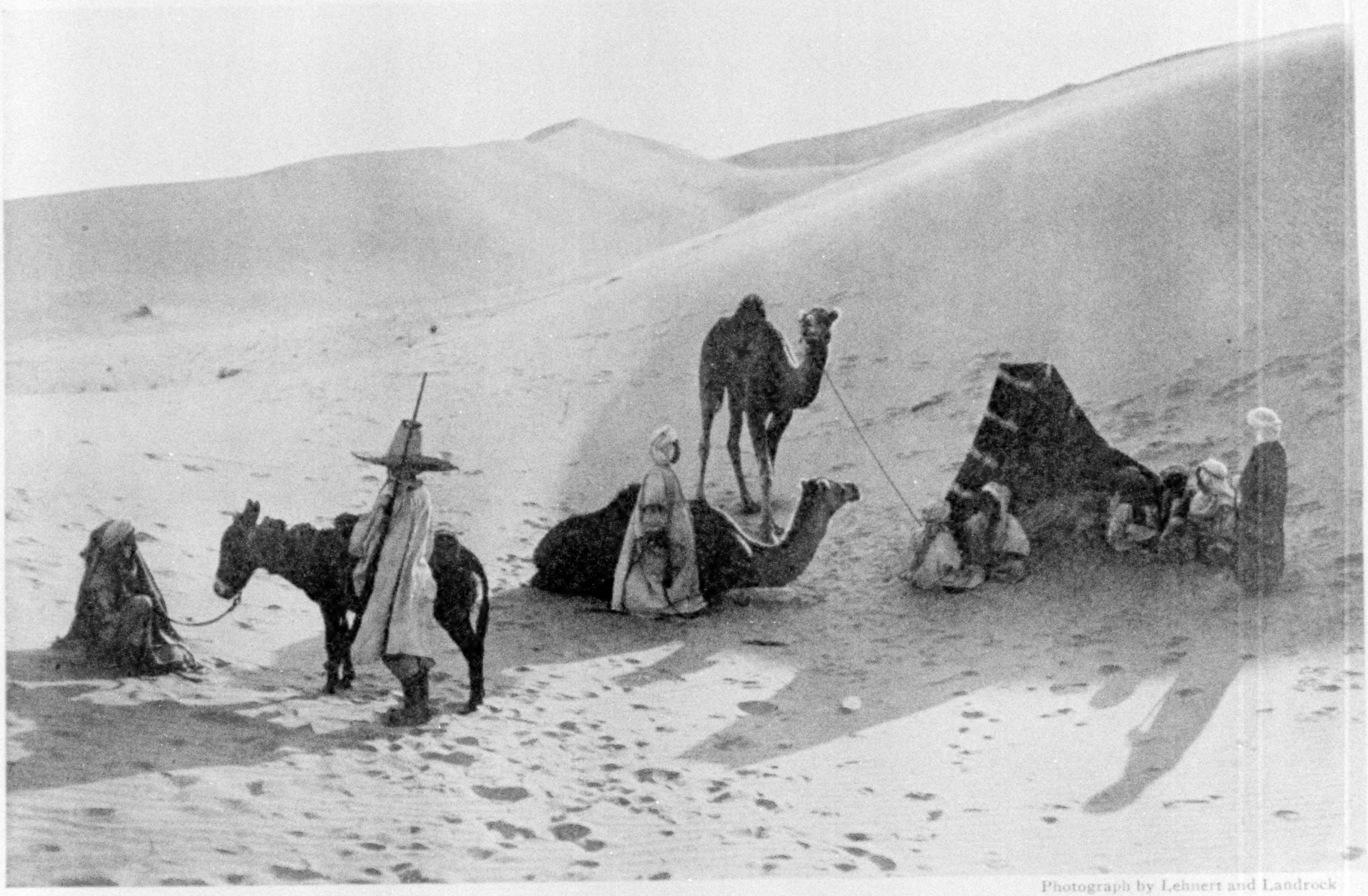
THE TRACTORS MAKING THEIR WAY THROUGH A SEA OF SAND

The personnel of the Trans-Sahara Expedition consisted of the manager of the Citroen automobile works, a former military airman, a representative of the French Air Ministry, a scientific observer, a moving-picture operator, and five expert mechanics. The longest single stage of the journey between supply stations was 812 miles.

Photographs from Andre Citroen

IN THE VALLEY OF THE WADI MIA

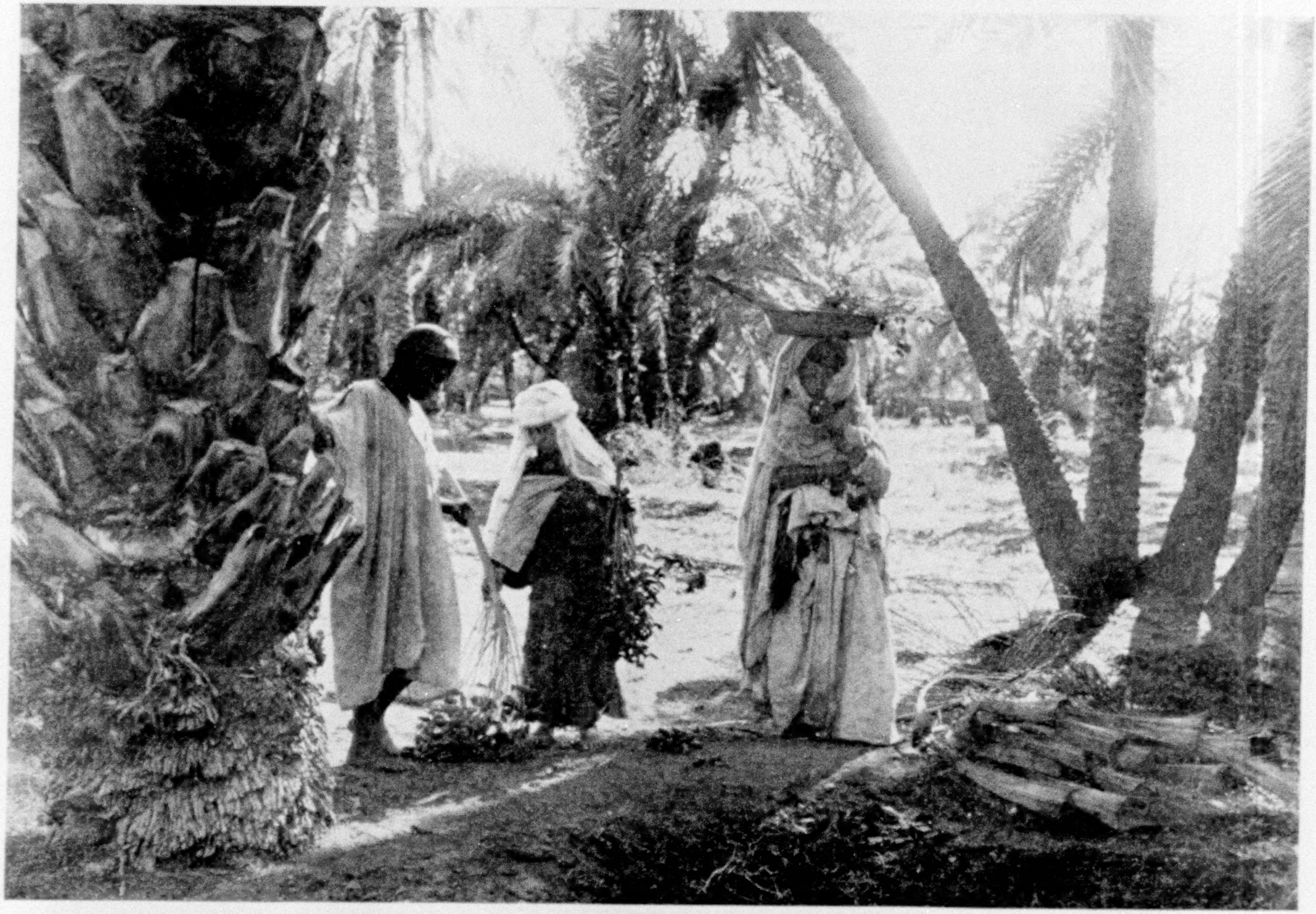
This deep-cut river bed descends from the Tademait plateau, and its dried-up stream was once one of the most important of this region. Though the Sahara has lost many of its former surface rivers, French engineers have irrigated large areas by tapping artesian waters.



Photograph by Lehnert and Landrock

A BEDOUIN CAMP OF NORTHERN AFRICA

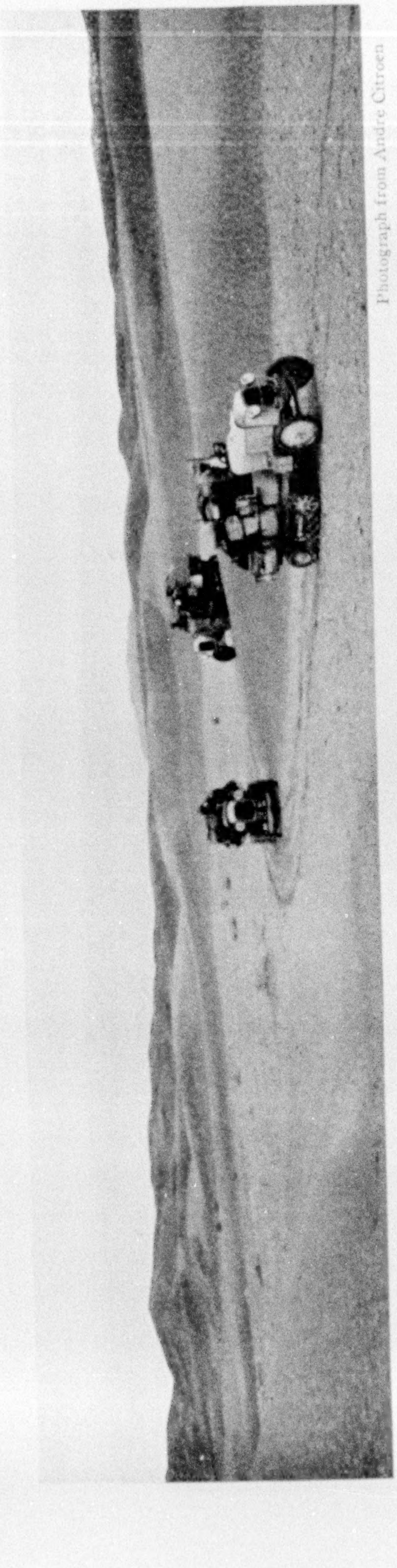
Probably no desert tribe arouses more interest in the western mind than do the Bedouins. From time immemorial they have lived in their black camel-hair tents in the desert, sometimes robbing caravans, sometimes trading in articles of their own manufacture, and occasionally nowadays condescending to a little agriculture.



Photograph by Lehnert and Landrock

CHILDREN COLLECTING DATES IN AN OASIS OF THE SAHARA

In many parts of the Sahara French engineers have sunk artesian wells, with the result that former waste places have been made to flourish with palms.



Photograph from Andre Citroen

A STRETCH OF THE DUNE REGION

The Sahara dunes are subject to continual change, under the influence of the winds; but, taken as a whole, their topography is permanent. They range in height, in various parts of the desert, from 60 to 300 feet.

sharp rocks and cut by deep crevasses. This is the plateau of Tademait, characterized by the remarkable black tint (or "desert varnish") of its rocks.

The next 280 miles, through the sinister Ain El Gettara Pass and across the vast plain of Tidikelt, were strenuous going. The ground was covered with boulders, difficult to clear, and a sharp lookout had to be maintained against marauders at the same time. Tidikelt is a region of mirages.

### ENTHUSIASTIC WELCOME AT HISTORIC IN-SALAH

At In-Salah, the succeeding station, the convoy was met by the entire population, waving palm branches and escorted by a camel corps and Arab horsemen firing salutes. This oasis is the last one in North Africa and a center for caravans from the French Sudan, the Hoggar, and the Aïr.

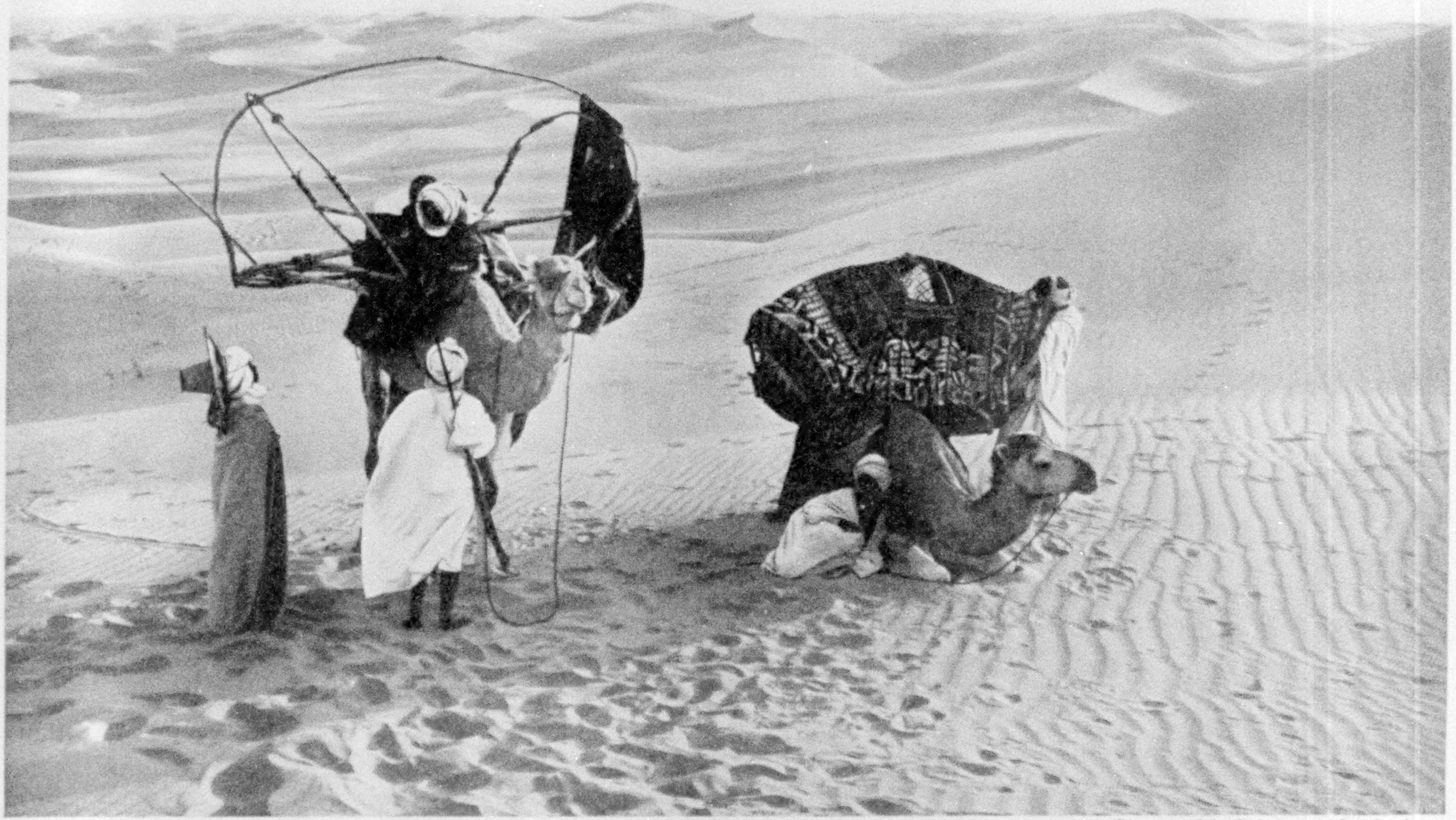
After leaving In-Salah the tractors continued over rocky ground, passing many carcasses of camels overcome by the sun and the desert. The Christmas camp was made in the blue mountains of Muydir, on the edge of the Hoggar country, the real center of the Sahara.

Then the convoy entered the Hoggar through a mountain pass, and beyond it lay perhaps the most perilous part of the journey—the almost waterless, treacherous Tanesruft, a region of sandstorms, boulders, and rocky valleys.

New Year's was spent at a well on the borderland between North Africa and French West Africa. Then another stop at Kidal, a small post in the southern Adrar (mountain) of the Iforas, and on through the Saharan region of the Sudan itself to Burem and the Niger. Here, for the first time in history, the true liaison between French colonies in northern and western Africa became a reality on January 4.

The remaining stretch along the Niger west to Timbuktu (see pages 72-86) was easily made in 27 hours without a stop.

As the convoy swung into the sand-blown streets of the ancient capital amid the cheers of the natives, a new chapter in the history of scientific exploration was concluded and civilization approached a bit nearer to the heart of Africa's most mysterious domain.



Photograph by Lehnert and Landrock

THE METHOD OF CROSSING THE DESERT WHICH MAY BE SUPERSEDED BY MOTOR TRANSPORTATION

Great care is exercised in selecting beasts of burden for a caravan trip across the Sahara. At towns in the desert, Sahara camels, accustomed to the great wastes of sand, are obtainable. The animals which live near the coast have become more or less accustomed to drinking at frequent intervals and require water every two or three days. Those of the Sahara can go much longer without water.

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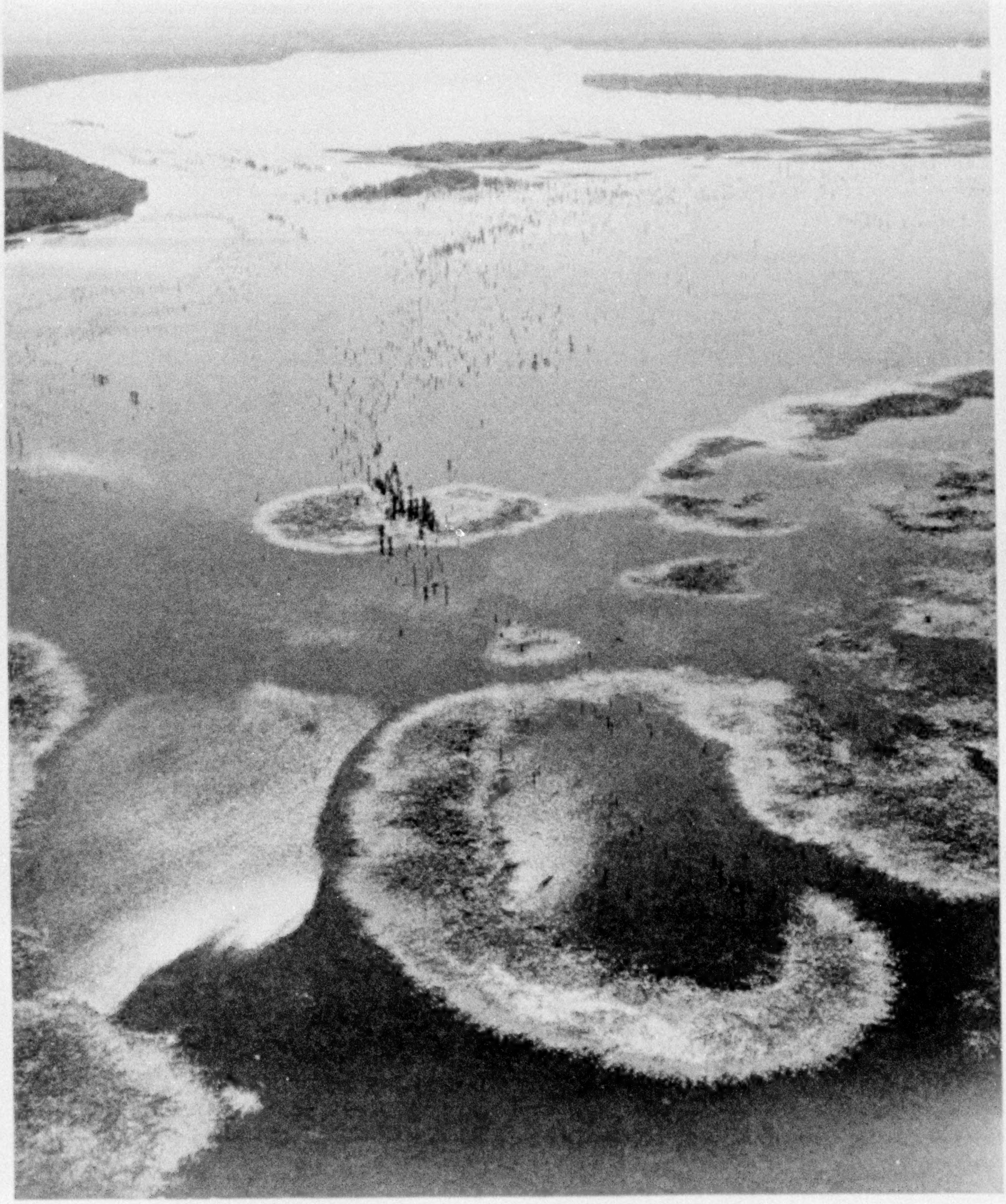


THE SOUTHEASTERN CORNER OF REELFOOT LAKE, SHOWING THE GREAT LILY-PAD CIRCLES IN THE FOREGROUND

The dark spots in the middle of the airplane picture are submerged cypress trees. Grassy Island and Willow Point extend out into the lake in the background.

# REELFOOT—AN EARTHQUAKE LAKE

## BY WILBUR A. NELSON

*With Illustrations from Official Photographs, U. S. Army Air Service, Taken by Captain A. W. Stevens and Lieutenant George W. Polk, Engineering Division*

REELFOOT, an earthquake lake of Tennessee, was born about the time that the first venturesome pioneers began to settle along the banks of the mighty Mississippi.

Perhaps De Soto, in his wanderings along the Mississippi River, saw this country as a vast unbroken wilderness. As he thrust wearily northward along the west bank of the "Father of Waters," to the great Indian village of Cahokia, he little dreamed that this placid wilderness would within three hundred years be torn and racked by Nature's forces, and that during one of the greatest earthquakes of historical time lakes covering tens of thousands of acres would come into existence over night.

The old Spanish settlement of New Madrid, formed many years after De Soto had come and gone, did, however, play a prominent part in recording the story of Reelfoot, for here resided many of our American pioneers whose letters supply the details of that, to them, awful winter.

### THE LEGEND OF REELFOOT LAKE

At the beginning of the 19th century this region was called Indian Country, and rightly so, for in the rich bottom lands dwelt a tribe of the Chickasaws, which camped at the base of bluffs that rose 300 feet above the Mississippi, providing the lookout points so needed in a wilderness.

Legend says that at the time of our story a mighty chief ruled wisely, yet his heart was heavy, for his only son had been born with a deformed foot. As the boy grew up he developed normally, but his walk was different from all other Indians. He walked and ran with a rolling motion; so his people called him Kalopin, meaning Reelfoot.

When the old chief died, Reelfoot became chief. He, too, was sad and lonely, for as yet none of the Indian maidens had stirred in him the thoughts of love. His father had often recorded to him tales of the mighty tribes dwelling to the south, and of the wondrous beauty of their maidens. So, restless in spirit, when the robins arrived from the north, seeking a mating ground, he likewise gathered a few of his chosen tribesmen—Osceola, Nashola, and Biwier—and wandered south in quest of a princess.

### THE DREAM PRINCESS IS FOUND

Many days they journeyed. Finally their canoes, floating down the river, entered a domain having different tribal customs, and there were signs which told them that they were approaching the abode of a mighty chieftain.

Reelfoot sent runners forward to notify the great Choctaw chief, Copiah, that a friendly party approached. Soon the chief's councilor came forward to welcome the strangers to the council fire.

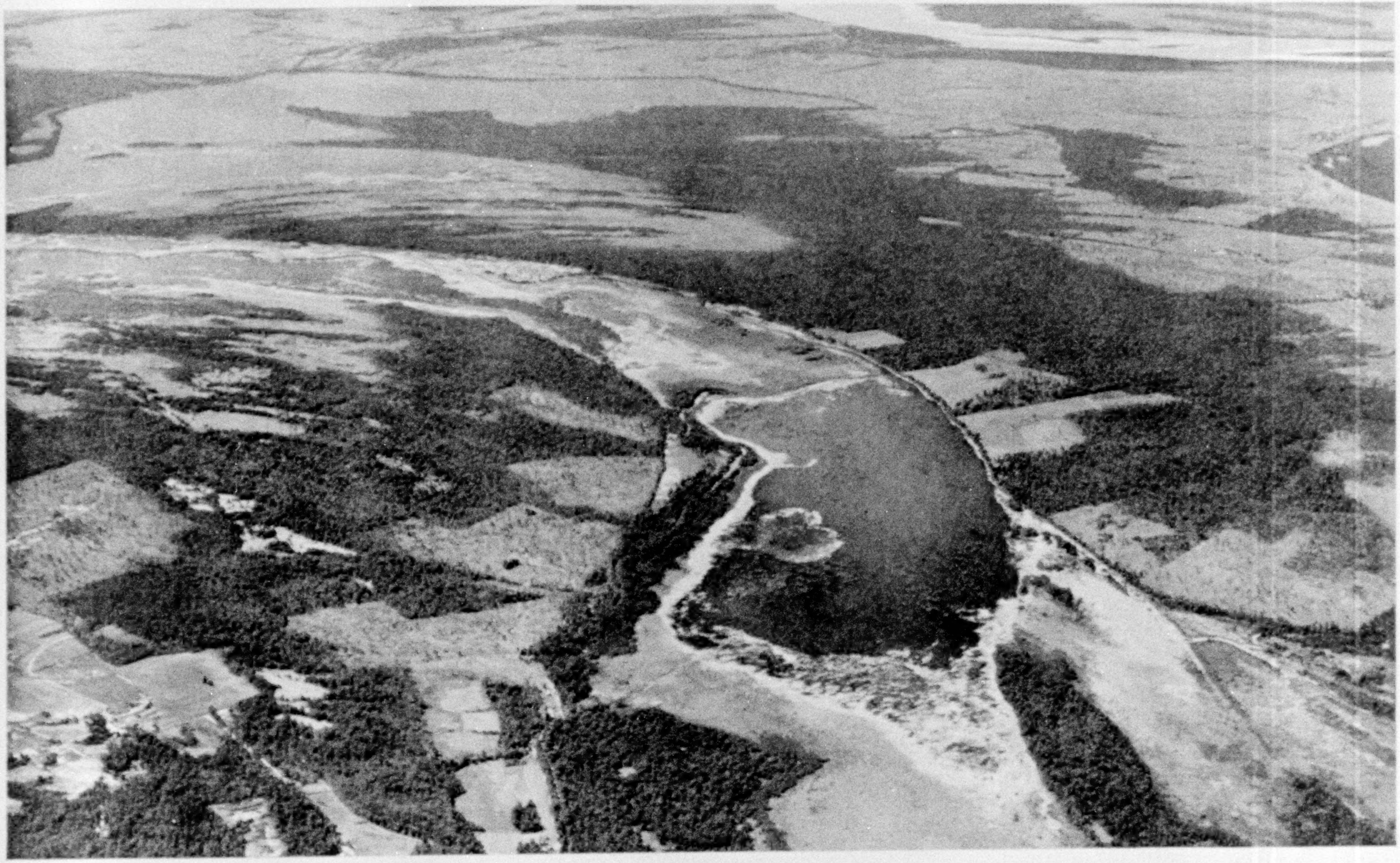
When the village was reached Reelfoot went forward to offer the requisite homage to Copiah, and then, continues the legend, he beheld his dream princess, more beautiful than he had ever dared imagine, sitting close by the side of the chief, her father.

The old chief was stately and dignified, as all Indians are on such occasions, and after they had smoked the great peace pipe and eaten of the freshly killed game, he inquired of young Reelfoot the reason for his visit.

Reelfoot replied that he was on a pilgrimage to find a princess to rule his tribe with him, and that now he saw his heart's desire for the first time.

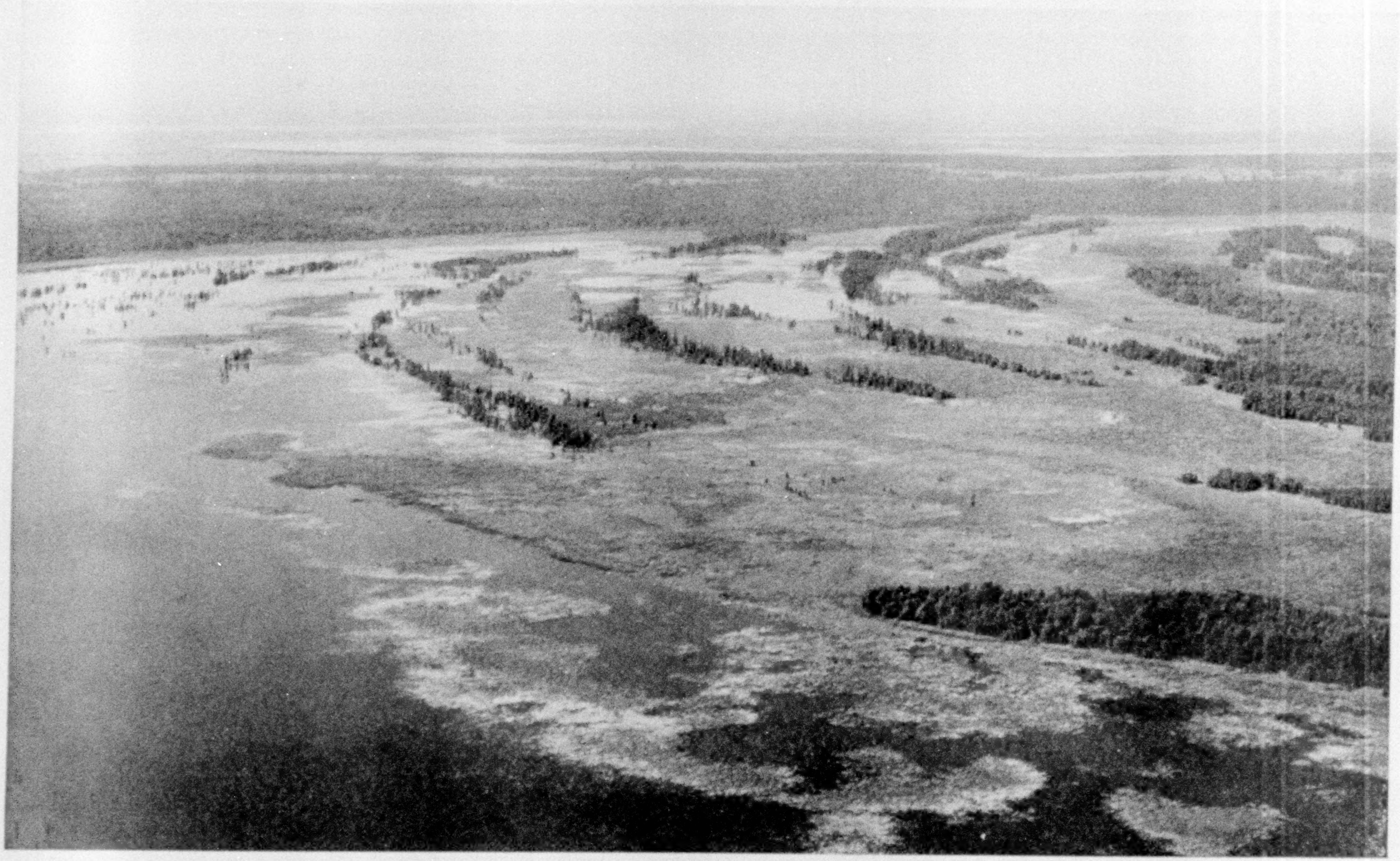
At this the old chief was filled with wrath, for he knew the beauty and entrancing charm of his only daughter, and what chief would want his daughter to marry one deformed, even though he be powerful!

So old Copiah told Reelfoot that his daughter was only to be given in wedlock to a Choctaw chieftain, and under no circumstances could she join a tribe which



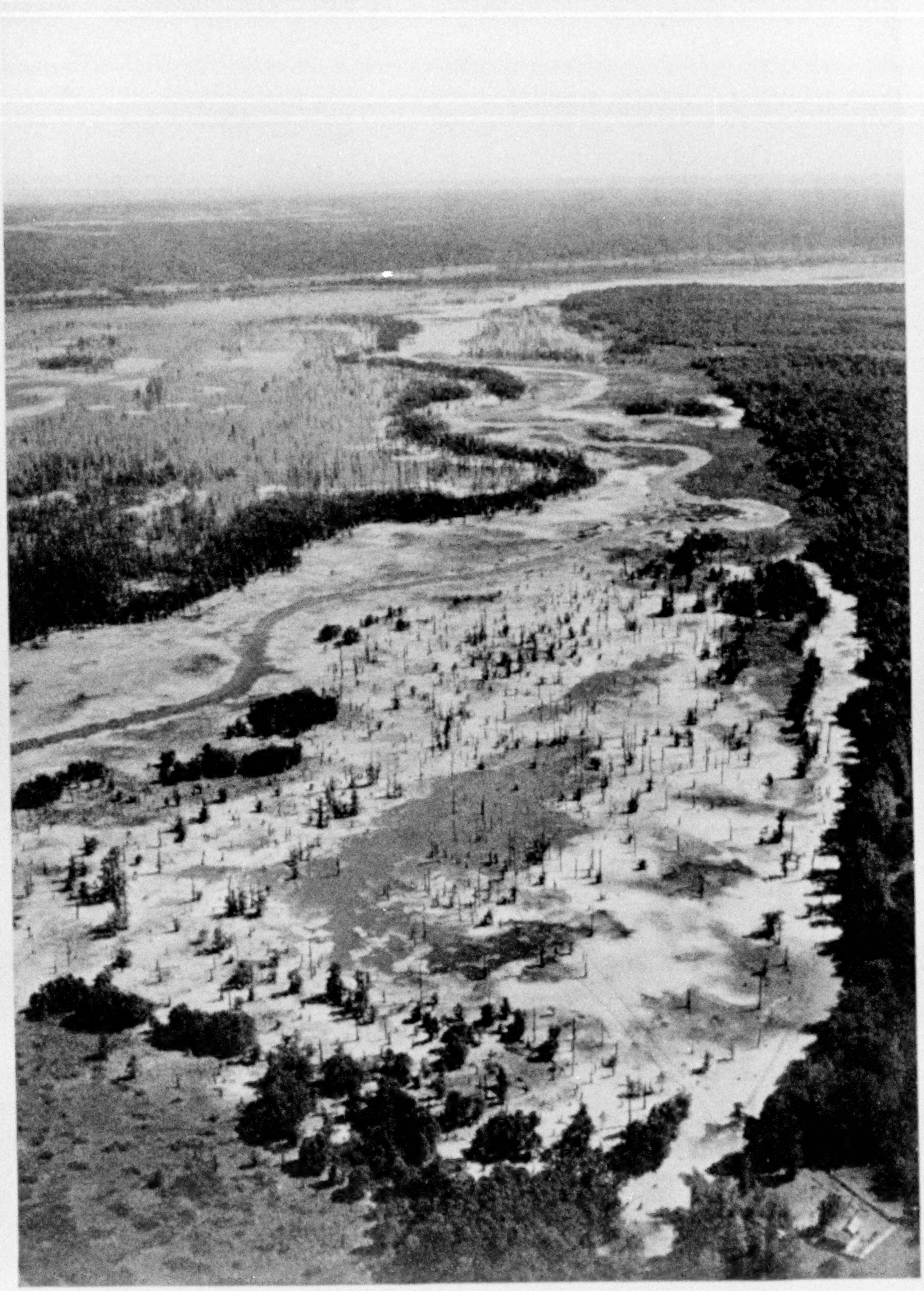
THE NORTHEAST CORNER OF REELFOOT LAKE AROUND WALNUT LOG

Walnut Log Hotel is situated in the clearing in the foreground, on the left bank of the lake. The light-colored area to the north of the water is shallow water, covered with lily-pad growth; the dark-colored water in the middle foreground is deeper water, free from lily pads, and the dark specks are dead cypress trees. This part of the lake is famous for its ducks. The Mississippi River is the light portion in the upper right corner, and the southern end of Reelfoot Lake is in the background to the left.



REFLECTED SUNLIGHT ON LILY PADS AND SEED MOSS IN REELFOOT LAKE PRODUCES THE EFFECT OF SNOW

This effect is produced only in a photograph, as it does not suggest snow in reality. Note the parallel lines of trees growing on the low crests, indicating the rhythmic motion of the earth at the time of the quake (see text, page 106).



AËRIAL VIEW OF THE NORTHEASTERN CORNER OF REELFOOT LAKE, SHOWING THE SUBMERGED CHANNEL OF BAYOU DE CHIEN

The channel shows up clearly in this airplane view, as the water is much deeper than the shallow lake water, and the lily pads only grow in shallow water, up to the banks of this old submerged channel. To the left of the Bayou de Chien are masses of cypress trees growing in water five feet deep (see also illustration, page 105).

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HICKMAN, KENTUCKY, JUST NORTH OF REELFOOT LAKE

The town lies a few miles north of the Tennessee line and is located on a 300-foot bluff at the edge of the Mississippi River. The white strips which look like reflections, on the right bank of the river, are submerged sand banks.

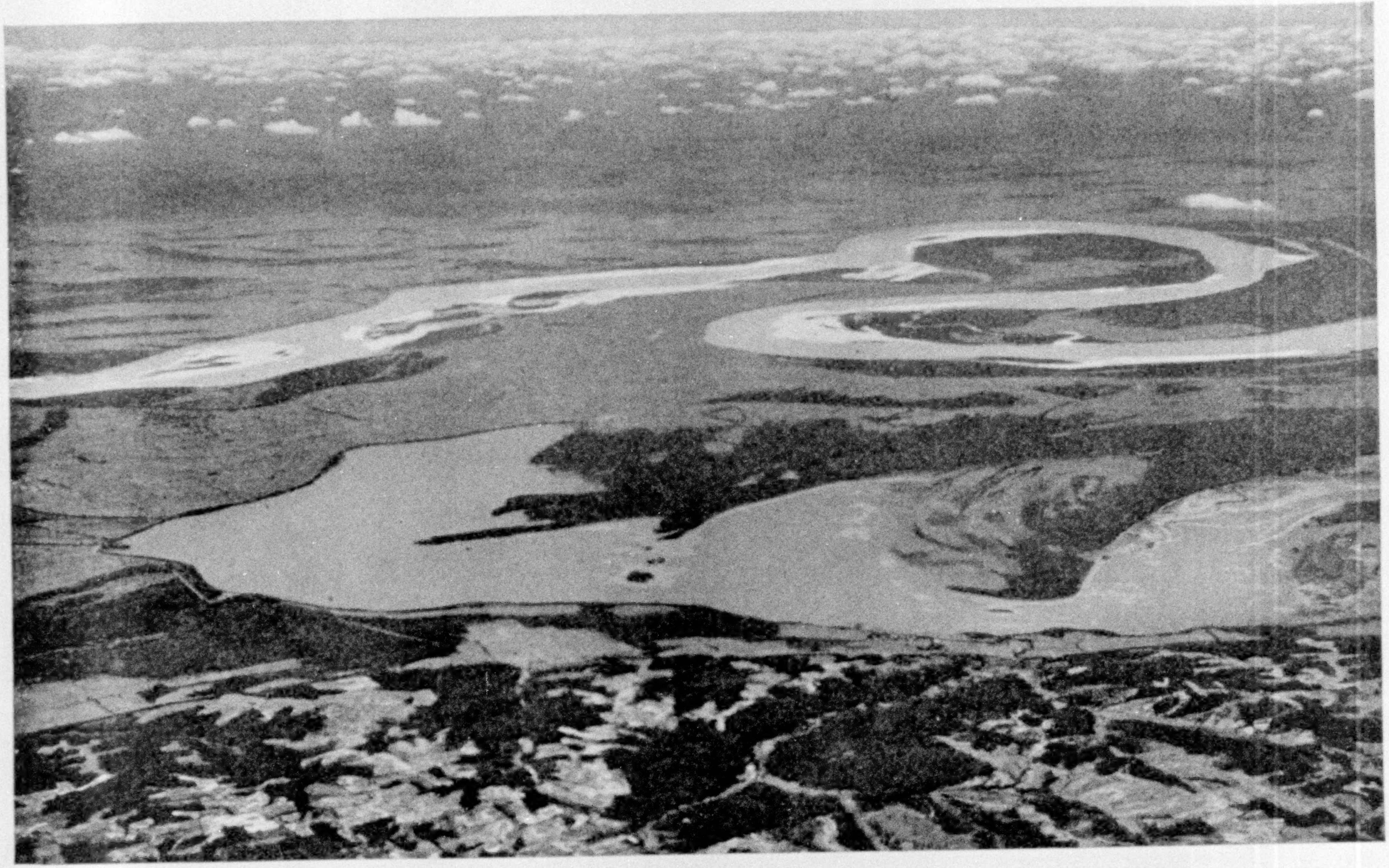
was so unfortunate as to have a club-footed chieftain.

This made Reelfoot sick at heart, but he was more firmly resolved than ever to have this one Indian maiden. So he offered her father pearls and skins and other treasures which would arouse envy even in the greatest chieftain's heart. Then the old chief sent for the tribe's medicine man, who called publicly on the Great Spirit.

The Great Spirit spoke to Reelfoot, saying that an Indian must not steal his wife from any neighboring tribe, for such was tribal law; and if he disobeyed and carried off the princess that He, the Great Spirit, would cause the earth to rock and the waters to swallow up his village and bury his people in a watery grave.

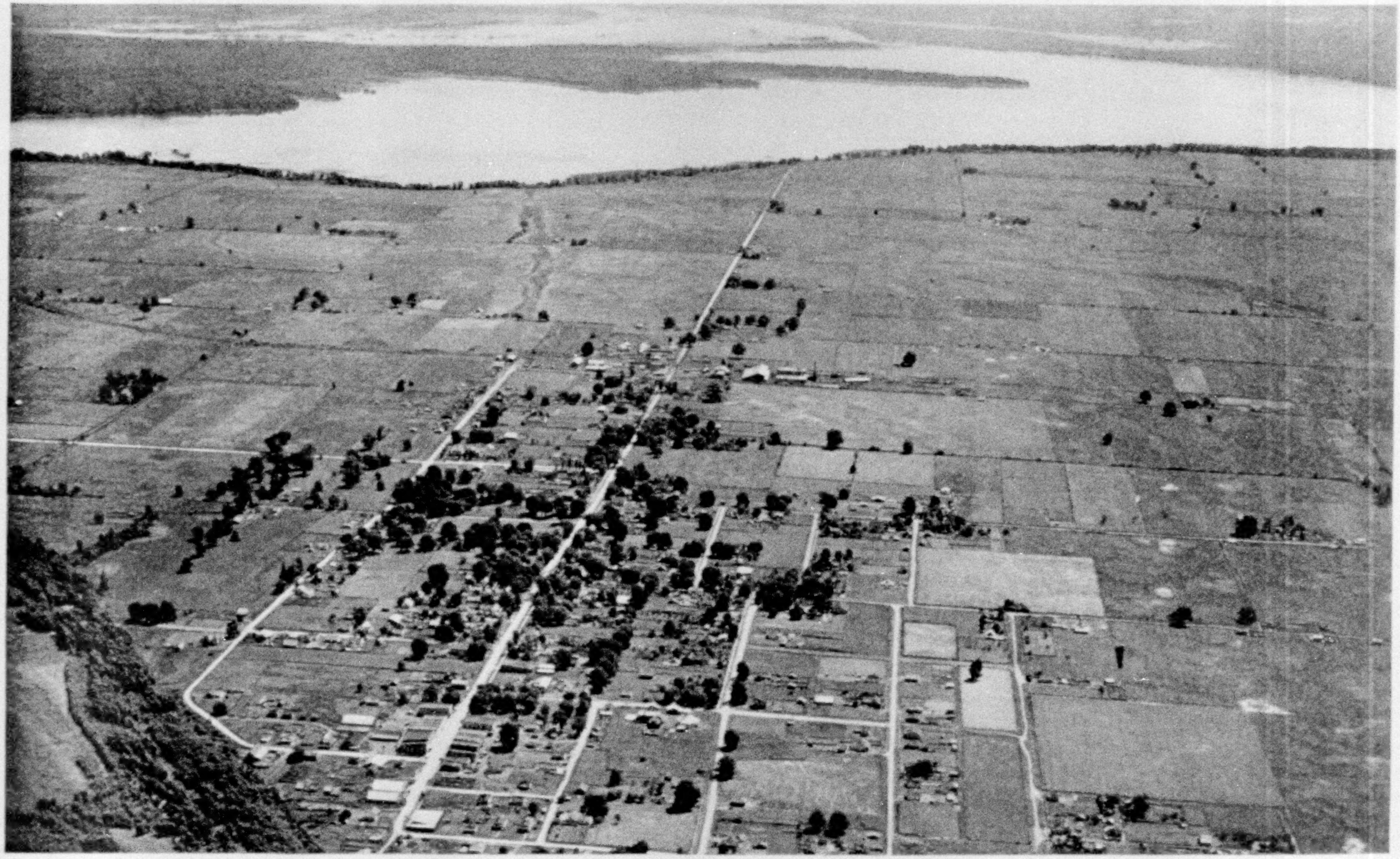
Reelfoot was frightened at this threat of dire punishment, and stifling his longings deep in his heart, sorrowfully turned his canoes toward the North Star and home.

Summer had come when the home country was reached, but to Reelfoot it



HILL LANDS OF THE REELFOOT LAKE SECTION IN THE FOREGROUND

Reelfoot Lake is in the center of the picture, the Mississippi River in the central background. The double bend of the river occurs along the line between Missouri and Kentucky, part of each bend being in each State. This view was taken looking toward the west. The cleared areas in the immediate foreground are farms; the dark areas are wooded lands.



AËRIAL VIEW OF REELFOOT LAKE AND TIPTONVILLE, LAKE COUNTY, TENNESSEE, FROM AN ALTITUDE OF 3,000 FEET

On the banks of the Mississippi River, looking eastward, with Reelfoot Lake in the background.

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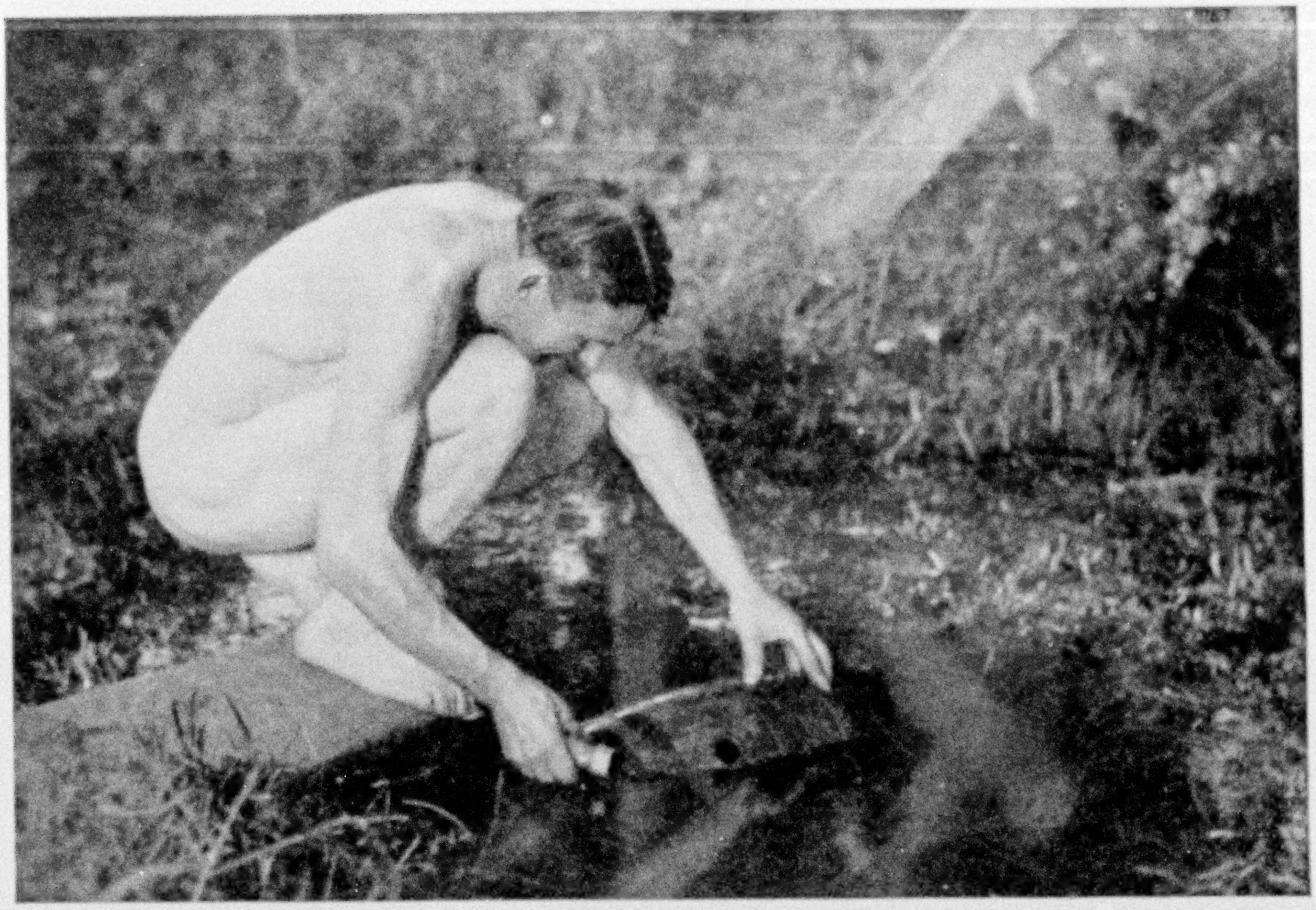


A COMBINATION REFRIGERATOR, BATHTUB, AND DRINKING FOUNTAIN

This spring proved a joy to the aviators who made the photographs illustrating the Reelfoot Lake region. Here it is being used for drinking purposes.

THE SAME SPRING AS A SWIMMING POOL

The flow is sufficiently abundant to provide an entire change of water in thirty minutes. The aviators also found it an excellent place in which to keep provisions cool.

lacked one thing—Laughing Eyes, forbidden to him by the Great Spirit. Through the long summer days the Indians fished and hunted, and Reelfoot as chief was doing his part in storing up food for the coming winter.

But his activities did not keep Reelfoot from thinking of his love and wondering if the Great Spirit would really do as he said.

### AND THE EARTH TREMBLED

For the first time Reelfoot did not want to believe the Great Spirit; so, as the days grew short and the maize was gathered, he planned with his warriors to go south and capture the forbidden maiden. When the first snows came they started, and, swooping down on the Choctaws, he captured the princess and fled back to the north.

Laughing Eyes was greatly frightened, for she had heard what the Great Spirit had said to Reelfoot. She feared for herself and implored that he send her back to her father; but Reelfoot was in love and, now that he possessed his longed-for bride, was willing to defy everything.

One starry night he brought his princess bride home, and there was great rejoicing among his people, for now their tribal family was complete. The festival fires burned; the pots boiled and the venison browned on the spit.

In the midst of the festival and the marriage rites the earth began to roll in rhythm with kettledrums and tom-toms.

The Indians tried to flee to the hills, but the rocking earth made them reel and stagger. Chief Reelfoot and his bride reeled also and the Great Spirit stamped his foot in anger. The Father of Waters heard and, backing on his course, rushed over Reelfoot's country.

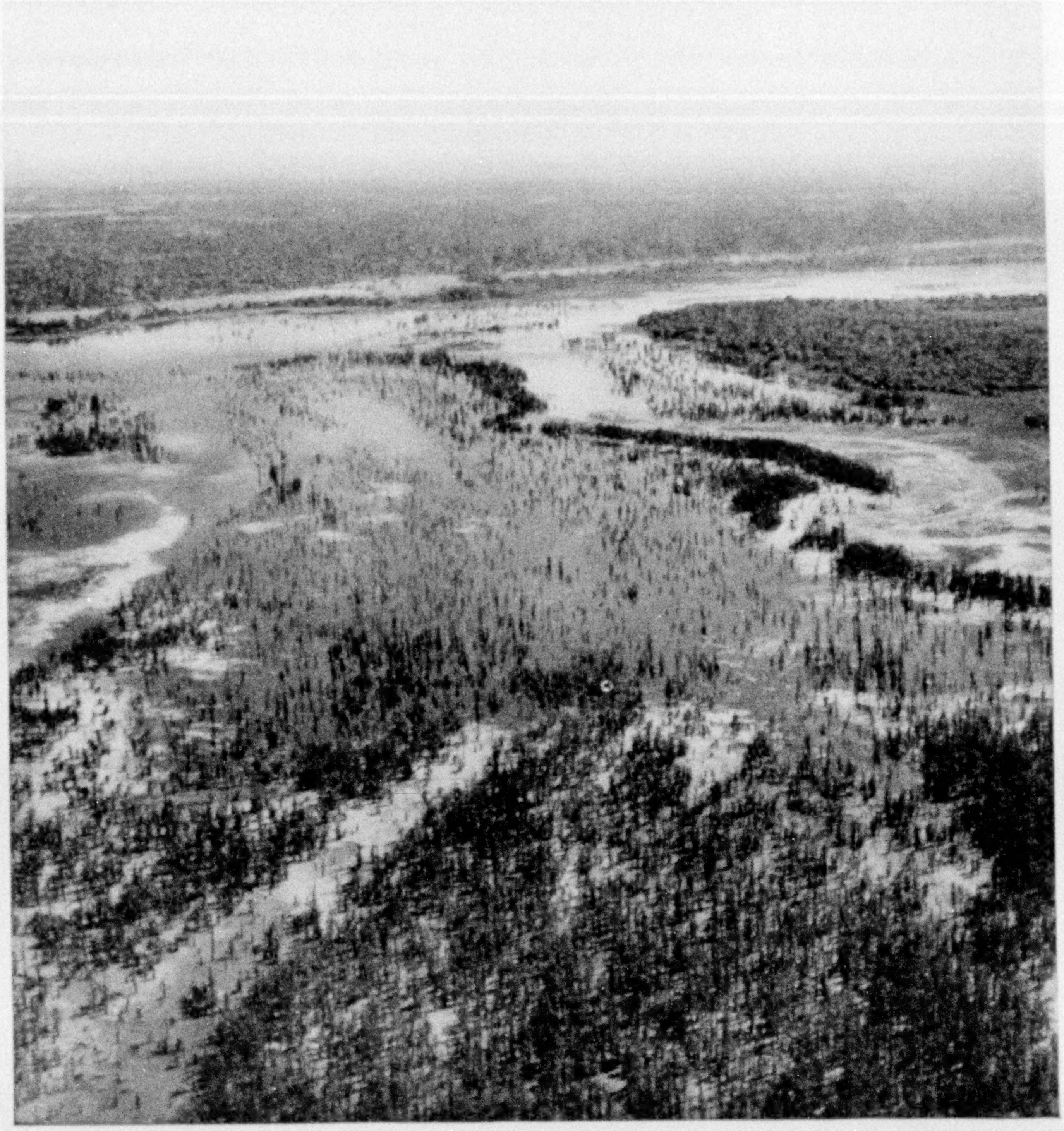
Where the Great Spirit stamped the earth the Mississippi formed a beautiful lake, in the bottom of which lay Reelfoot, his bride and his people.

Such is the Indian legend of Reelfoot Lake.

### THE ACCOUNT OF AN EYEWITNESS

Here is the account of the earthquake as given by one of the pioneers, Eliza Bryan, living at New Madrid, near the cliffs where Hickman now stands (page 99). She wrote to her pastor, the Reverend Lorenzo Dow, the following letter:

> "DEAR SIR:
>
> "On the 16th of December, 1811, about 2 o'clock a. m., a violent shock of earthquake, accompanied by a very awful noise, resembling loud but distant thunder, but hoarse and vibrating, followed by complete saturation of the atmosphere with sulphurous vapor, causing total darkness. The screams of the inhabitants, the cries of the fowls and beasts of every species, the falling trees, and the roaring of the Mississippi, the current of which was retrograde for a few minutes, owing, as it is supposed, to an eruption in its bed, formed a scene truly horrible.
>
> "From that time until about sunrise a number of lighter shocks occurred, at which time one more violent than the first took place with the same accompaniments.
>
> "There were several shocks in a day, but lighter than those mentioned, until the 23rd of January, 1812, when one occurred as violent as the severest of the former ones, accompanied by the same phenomena.
>
> "From this time on until the 4th of February the earth was in continual agitation, visibly waving as a gentle sea. On that day there was another shock, nearly as hard as the preceding ones; next day four such, and on the 7th, at about 4 o'clock a. m., a concussion took place so much more violent than those preceding it that it is denominated the 'hard shock.'
>
> "The Mississippi first seemed to recede from its banks, and its waters gathered up like a mountain, leaving for a moment many boats, which were on their way to New Orleans, on the bare sand, in which time the poor sailors made their escape from them.
>
> "Then, rising 15 or 20 feet perpendicularly and expanding, as it were, at the same time, the banks overflowed with a retrograde current rapid as a torrent. The boats, which before had been left on the sand, were now torn from their moorings and suddenly driven up a little creek, at the mouth of which they had laid, to a distance in some instances of nearly a quarter of a mile.
>
> "The river, falling immediately as rapidly as it had risen, receded within its banks with such violence that it took with it whole groves of young cottonwood trees which had hedged its borders. They were broken off with such regularity in some instances that persons who had not witnessed the fact could be with difficulty persuaded that it had not been the work of man. The river was literally covered with wrecks of boats.
>
> "The surface of the earth was from time to time by these hard shocks covered to various depths by sand which issued from fissures that were made in great numbers all over this country. Some of these closed up immediately, after they had vomited forth their sand and water. In some places, however, a substance resembling coal or impure stone coal was thrown up with the sand.
>
> "It is impossible to say what the depth of the



AN AIRPLANE VIEW OF REELFOOT LAKE, LOOKING TOWARD THE EASTERN BANK AT SAMSBURG

All of the trees in the foreground are growing in lake water. Reflection of the sunlight on the seed moss and the lily pads growing over the lake causes the white areas. Nick's Toehead is in the right background and the buried channel of Bayou de Chien to the left of it.

fissures was; we have reason to believe that some of them were very deep.

"The site of this town was settled down at least 15 feet, but not more than a half mile below town there does not appear to be any alteration of the bank of the river.

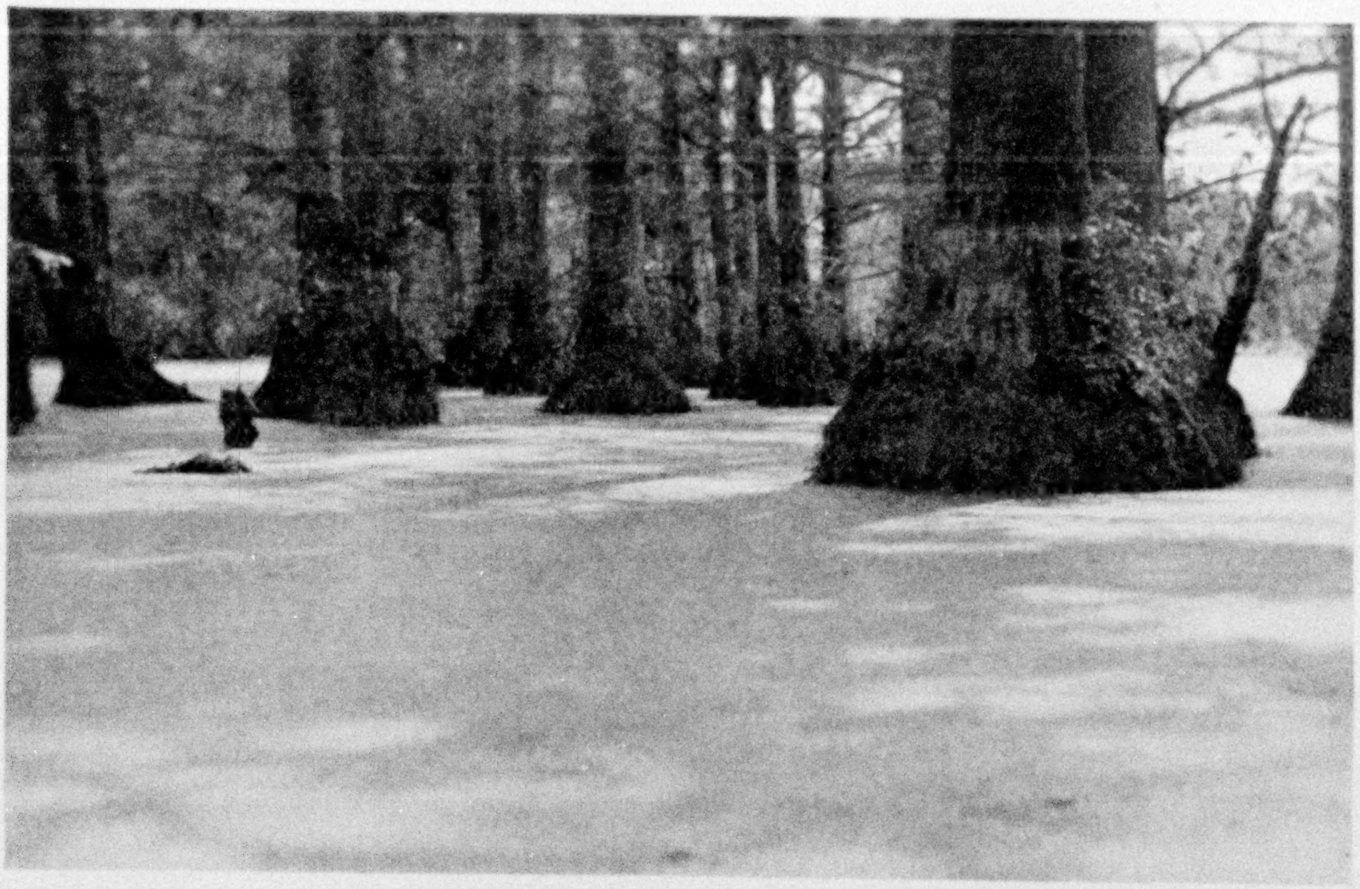
"Back from the river large ponds, or lakes, which covered a large part of the country, were nearly dried up. The beds of some of them are elevated several feet above the former banks, producing an alteration from their original state of 10 or 20 feet, and lately it has been discovered that a lake was formed on the opposite side of the Mississippi, in the Indian country, upwards of 100 miles long and from one to six miles wide, of a depth of from 10 to 50 feet.

"We continue to feel light shocks occasionally. It is seldom that we are more than a week without feeling one, and sometimes there are three or four in a day. There were two this winter past, much harder than for two years past; but since then they appear to be lighter than they have ever been.

"Your humble servant,

"Eliza Bryan."

Several such letters are full of interesting detail, yet now we know that the



CYPRESS TREES GROWING IN WATER COVERED WITH A CARPET OF SEED MOSS

facts were greatly exaggerated. For example, the 100-mile lake is nearer 14 miles in length and 4½ miles in width.

This we do know and realize, however: that such an earthquake, if occurring at the present time, would probably cause ten times the damage which followed the San Francisco earthquake of 1906.

### MANY OTHER LAKES FORMED

Reelfoot was not the only lake formed, for large areas in eastern Arkansas and northwestern Louisiana were partly submerged and a number of small lakes formed. This earthquake, known historically as the New Madrid earthquake, caused a settling and rising of the land over a large territory, and partly demolished the old Spanish settlement from which it was named.

Although the region affected was a wilderness, it was a wilderness which had lured many travelers, and during that winter of 1811-12 the frontier settlements of the Mississippi were visited by Audubon, John Bradbury, a noted English botanist, and Major Long, with his expedition, on the way to the Rocky Mountains.

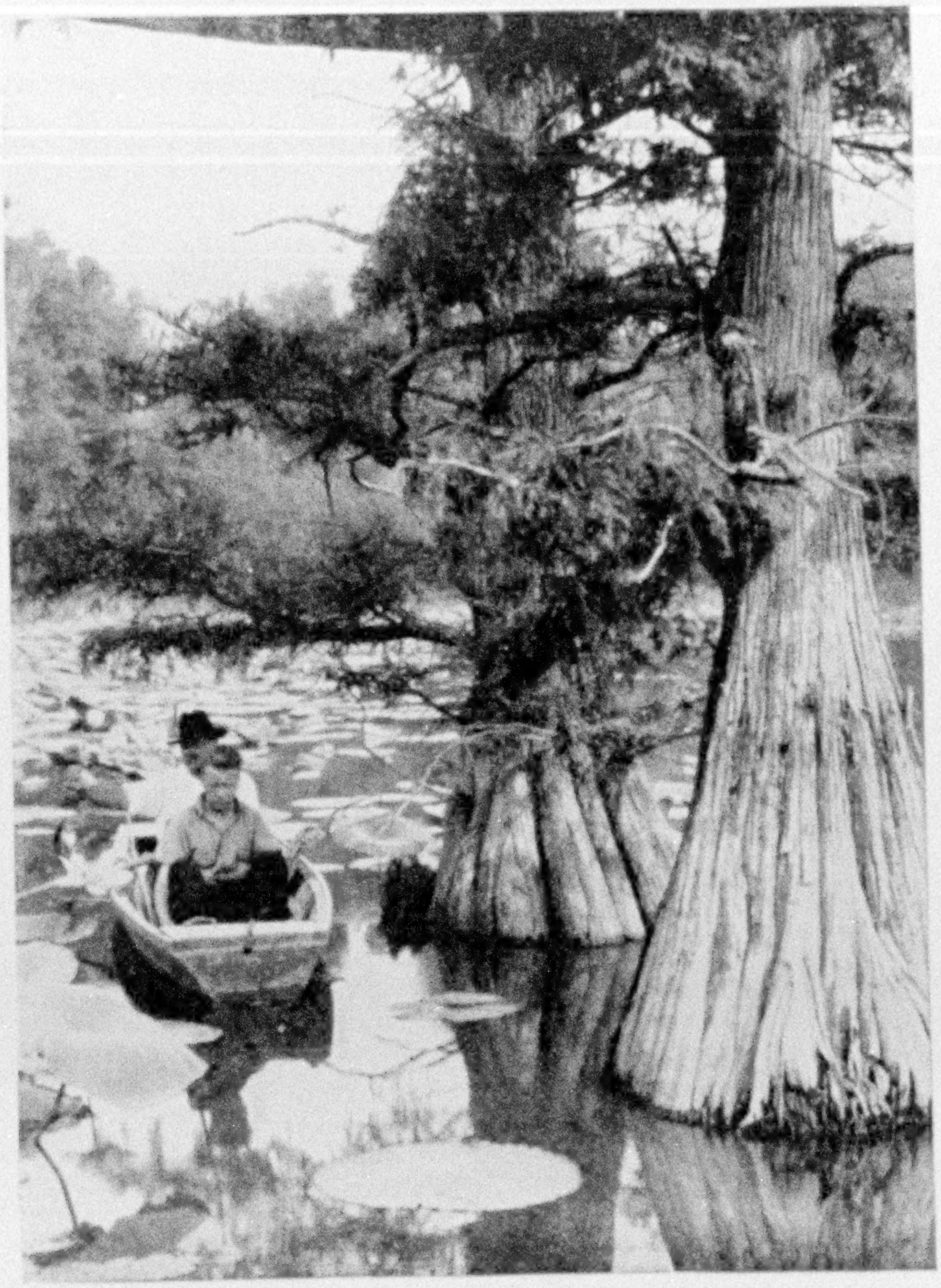
In middle Tennessee lived Andrew Jackson, practicing law in the primitive courts during periods of quietude between his expeditions against Indian foes. Davy Crockett lived near by and was getting his training, which ended so tragically in the Alamo.

Most of these noted men left accounts of what happened.

General Rogers, of Revolutionary fame, living at Rock Island, on the Caney Fork River, at the foot of Cumberland Mountains, 200 miles to the east, saw great blocks of sandstone, loosened from the top escarpment, 1,000 feet above the river, crash down the mountain sides.

A great area throughout America was affected by this earthquake. Far up in the northern woods of Canada the Indians reported that earth tremors occurred; to the west, in Missouri and Arkansas, the reports of James's expedition say that the Indians were terrified by the same quake, while to the southwest, on the Washita River, there was much fear among the settlers. At New Orleans, 500 miles away; at Detroit, 600 miles away; at Washington, 700 miles away, and even at Boston, at a distance of 1,100 miles, slight tremors were felt.

What occurred in the Reelfoot region? What happened to New Madrid? There were no hard rocks in that section; all the country was covered by rich loams and



SECOND GROWTH OF CYPRESS TREES IN REELFOOT LAKE

clays, and under this surface soil was layer after layer of loose sand and clay, down to a depth of 2,000 feet.

The earth waves came up through these 2,000 feet of sand and clays, and where breaks occurred on the surface poured streams of quicksand from deeply buried layers, veritable sand geysers.

The great forest trees moved, with branches interlocked, like fields of grain before the wind. Their trunks, not having the suppleness of youth, fell prostrate or reclined at grotesque angles to the earth.

### MOTION OF EARTH SHOWN BY TREES

The rhythmic motion of the earth is well shown by the parallel lines of cypress trees growing on the low crests of the many rolls in the Reelfoot Lake region (see illustration, page 97.) An airplane view brings to life again the roll of the earth as it occurred more than a century ago.

New Madrid, laid out by the Spaniards on the banks of the Mississippi, was near the center of this earth movement, and it fared badly; for here the bluffs settled and the sand geysers spouted out of crevices, which, according to eyewitnesses, were 100 feet deep. The river banks caved in and most of the old town was absorbed into the Mississippi.

The happenings are vividly described in a letter by one eyewitness, who recounts the experiences of a river-boat captain:

"We immediately cut his cable, and he put off into the middle of the river, where he soon found the current changed. The boat hurried up, for about a minute, with the velocity of the swiftest horse, and he was obliged to hold his hand to his head to keep his hat on. On the current running its natural course, which it did gradually, he proceeded down the river, and at about daylight came to a most terrific fall, which, he thinks, was at least six feet perpendicular, extending across the river and about half a mile wide.

"The whirls and ripplings of this rapid were such that his vessel was altogether unmanageable and destruction seemed inevitable; some of the ripples, he thinks, were at least 30 feet deep and seemed to be formed by the water's being violently sucked into some chasm in the river's bottom.

"He and his men were constantly employed in pumping and bailing, by which,

ALONG THE SOUTHERN BANK OF REELFOOT LAKE, NEAR THE SPILLWAY

and the aid of Providence, he says he got safe through. As soon as he was able to look around he observed whole forests on each bank fall prostrate, to use his own comparison, like soldiers grounding their arms at the word of command.

"On his arrival at New Madrid he found that place a complete wreck, sunk about 12 feet below its level, and entirely deserted; its inhabitants, with those of the adjacent country who had fled there for refuge, were encamped in its neighborhood. He represents their cries as truly distressing.

"A large barge, loaded with 500 barrels of flour and other articles, was split from end to end and turned upside down at the bank. Of nearly 30 loaded boats, only this and one more escaped destruction. The water ran 12 feet perpendicular and threw many of them a great many rods on shore; several lives were lost among the boatmen."

Just to the south was Caruthersville, which, according to all accounts, could justly be called the Sodom of the United States, for the entire town was destroyed. The inhabitants were more fortunate, however, than the ancient people, in that they found safety in the hills and forests.

A graphic description of this community has been left by Timothy Flint:

"They had their settlement, which consisted of 100 families and which was located in a wide and very deep and fertile bottom, broken up. When I passed it and stopped to contemplate the traces of the catastrophe which remained after seven years, the crevices where the earth had burst were sufficiently manifest, and the whole region was covered with sand to a depth of two or three feet.

"The surface was red with oxided pyrites of iron, and the sand blows, as they were called, were abundantly mixed with this kind of earth and with pieces of pit coal. But two families remained of the whole settlement. . . . When I resided there, this district, formerly so level, rich, and beautiful, had the most melancholy of all aspects of decay, the tokens of former cultivation and habitancy, which were now mementos of desolation and destruction.

"Large and beautiful orchards left uninclosed, houses uninhabited, deep chasms in the earth obvious at frequent intervals. Such was the face of the country, although the people had for years become so accustomed to frequent and small

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TRAVERSING THE DEAD CYPRESS STUMPS OF REELFOOT LAKE

shocks, which did no essential injury, that the lands were gradually rising again in value, and New Madrid was slowly rebuilding with frail buildings adapted to the apprehensions of the people."

During the last 100 years the Mississippi River has continued to ravage the areas along its course during the flood seasons, and as New Madrid was partly submerged, due to the 1811-12 earthquake, so was Tiptonville in 1878, when it came in the path of this mighty current, at this point cutting away its eastern bank.

Day after day the river tore away its bluff bank, eating gradually up to the town; and then one who was there saw the spectacle of a moving town, for as the river cut into the settlement the houses were moved out and over to the far edge of the community. Thus a considerable portion of the town was gradually subjugated to the devouring power of the river in 1880. Now, content with what it has done, it is gradually moving away again to the west, leaving the town far from its former channel (see page 101).

While the Mississippi writhed back and forth across its mighty plain, the newly born Reelfoot Lake grew more beautiful, and Nature began to heal scars on the landscape which were inflicted at its birth. Its clear, brownish water became the home of many fish and its surface was dotted with lily pads, called "yoncopins," whose gorgeous flowers had the imprisoned yellow of a river sunset. In and around the stunted cypress growths, struggling for existence in five feet of water, was a filmlike iridescent green carpet, called "moss seed." Along the borders of the lake a dense growth of saw grass, mulefoot, smartweed, and even wild rice soon appeared.

### A LAND OF DELIGHT FOR THE NATURALIST

To this haven of beauty, teeming with plant growth and fish, soon came, on their yearly 20,000-mile pilgrimage, the wild denizens of the air—ducks, geese, water turkey or cormorants, coots, and the white heron, while the rail, gallinule, bittern, and teal nested among the saw grass and the lily pads.

As wild fowl and wood folk flocked in, so did the French trapper and the American hunter and pioneer. Here one still finds the mink, weasel, and otter,

A CATCH OF REELFOOT LAKE FISH AT SAMSBURG

along with our friends the opossum and raccoon.

As the country was gradually developed, a number of the sport-loving settled along the lake and lived on fish from its waters and the fowls from its marshes, while the trapping of animals supplied their necessary revenue.

Located in the most-used highway of migratory birds, Reelfoot Lake is visited in the spring and autumn by no small percentage of our journeying waterfowl. From a naturalist's standpoint, the region is one of great interest, for here is to be found the Austroriparian fauna, a name designated by scientists to indicate those forms of plant and animal life which inhabit the warm region of the Gulf Coast and up the bottoms of the Mississippi River to its junction with the Ohio.

Here, too, one finds the pecan tree in all its productiveness, the bald cypress, and typical southern swamp timber, draped and festooned with wild grape and rattan vines, while on such land as has been cleared cotton is the staple crop.

The Purple Gallinule, Mississippi and Swallow-tailed Kites, Little Blue Heron, Chuck-will's-Widow, Loggerhead Shrike, and Florida Barred Owl mark Reelfoot Lake as their northernmost point of distribution, or nearly so, while in late summer large flocks of the Wood Ibis, locally called Gourdhead, visit the lake after their breeding season is over in Louisiana.

While the season of migration marks the high tide of bird life on the lake, its summer residents are numerous and of great interest. An active ornithologist should be able to list 250 species of birds here during the course of a year.

### HAUNT OF EAGLES, HERONS, AND CORMORANTS

Our national bird, the Bald Eagle, still holds its own here, amid the great expanse of forest with which the lake is surrounded, and enjoys a mixed bill of fare, consisting of swamp rabbit, fox squirrel, and fish, frequently securing the latter by robbing the Osprey in mid-air.

At least two pairs of eagles nest here at present, choosing the tops of the largest bald cypress for their huge nests, at a height of 150 feet or more above the

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ground. One of these nests is located adjacent to a large nesting colony of Great Blue Herons and Double-crested Cormorants, and it may be surmised that the young of these birds are always on the ample bill of fare spread out for the consumption of the young eaglets.

Two large colonies of the Herons and Cormorants have been located and visited by Mr. A. F. Ganier, of Nashville, who has made a study of the animal life of the lake. In both cases the birds have chosen an isolated portion of the cypress swamp, where several acres of the trees, standing in waist-deep water and inaccessible by boat from the open lake, have insured a relatively safe nesting place.

Each colony was found to contain about 400 nests, perhaps a third of which were those of Cormorants, the nests being placed in the tops of the cypress trees at an average height of 110 feet above the water.

### HERONS AND CORMORANTS IN SAME TREE

Several nests of each of the two species are frequently placed in the same tree, the huge platforms of the Herons being placed well out on the branches, while the compact, rounded nests of the Cormorants, are saddled in the crotches formed by the larger limbs at their junction with the bole of the tree.

By the last week in April the nests of the Herons are occupied by hungry and vociferous young, while the Cormorants are just settling down to the task of incubating their four or five chalky-white eggs. Within the last few years a colony of American Egrets nested at the upper end of the lake, but these lovely birds were suddenly "shot out" by plumers, and it is not now known if any of the survivors have been able to reëstablish themselves in the vicinity. A small colony of

A THIRTY-FOUR POUND CATFISH TAKEN IN REELFOOT LAKE

The waters of this region teem with Bream, Gar, Crappie, and many other varieties of fish, which are caught in quantities for market.

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Little Blue Herons exists at the south end of the lake, while the ever-present Green Heron completes the roll call for the breeding members of this family.

The ducks which remain to breed are confined to the Hooded Merganser and the beautifully plumaged Wood Duck, both of which nest in hollow trees, usually above the water. The latter species is fairly common here, though nearly extinct elsewhere over its former range.

A few other ducks which are found throughout the summer are crippled individuals, incapacitated during the hunting season, and it is claimed that these occasionally mate and breed.

Reelfoot is not suited for the breeding of ducks, other than the tree-nesting variety, because of the fact that there is little or no shallow marsh in its environs. The immense tracts of saw grass are submerged during the breeding season by several feet of water, while the shallow edges are occupied by growths of trees, willows, and button bushes.

Many marsh-loving birds that would otherwise nest here are discouraged from doing so by the lack of shallow grass-grown water in which to wade. The little Least Bittern, however, is a summer resident in the saw grass and the Coot is said to breed here occasionally also.

One of the most characteristic birds of the lake is the Prothonotary or Golden Swamp Warbler, which nests abundantly all about the lake, in cavities of the ancient cypress stumps. Many a fisherman, tired of his quest of the finny tribe, has laid his pole aside to watch these dainty birds, attired in gold and brown, examine each near-by stump and snag, and perhaps even the prow of his boat, with no show of fear whatever and with a constant ringing song of cheer.

The hunter's season at Reelfoot begins October 15, and old timers flock here during the first big rain, knowing that it will be followed by a cold snap and accompanied by an avalanche of ducks and geese. The Mallards are always most numerous, but the Pintails, Redheads, Black Duck, Teal—in all about 20 varieties—are to be found here. Hunters in the near-by cities are notified by telegraph by their guides when a "flight is on," and a mad influx of Nimrods follows.

The inclinations of the moving ducks cannot be foretold by even the most experienced of the local hunters, and the flight may last a week or only for a day. At times no amount of shooting seems to affect their stay, while at other times a day's bombardment will send them all to the near-by Mississippi River, to the lakes of the St. Francis Basin, some miles to the westward, or perhaps hurry them on in their journey to the swamps and rice fields along the Gulf Coast.

When ducks fail, the hunter turns to the Coot, which at times is present in such numbers as fairly to blacken the surface of the lake. "Acres and acres of Coots" is the word brought back quite frequently by hunters who have filled their bags.

Many years ago Swans were among the most abundant of the migrating waterfowl on this extensive sheet of inland water. As late as 50 years ago they were shipped to Nashville and Memphis in box-car lots, where they were retailed at 25 cents apiece.

The Canada Goose is a regular winter visitor, and nested here in the earlier days. They adapted themselves to local conditions by choosing for their nesting sites the stumps of broken-off cypress trees, and there in comparative safety feathered their nests, after the manner of geese, with down from their own breasts.

### THE CORMORANTS CONDUCT FISH DRIVES

During the fall and early spring, immense flocks of Double-crested Cormorants gather on the lake and consume considerable numbers of small fish.

These birds conduct "fish drives" by forming in long, crescent-shaped lines and beating the surface of the water with wings and feet. They cause such pandemonium among the small fish that the latter rise to the top and are easily captured.

When their appetites are satisfied, the birds fly up into the dead cypress trees, where their black bodies line the limbs like carrion crows, or else they betake themselves to high air and soar away to some fresh inlet to repeat the maneuver. Local fishermen call them "nigger geese," and are glad that only comparatively few remain at the lake to breed.

The smaller mammals are as much at home in this primeval habitat as are the

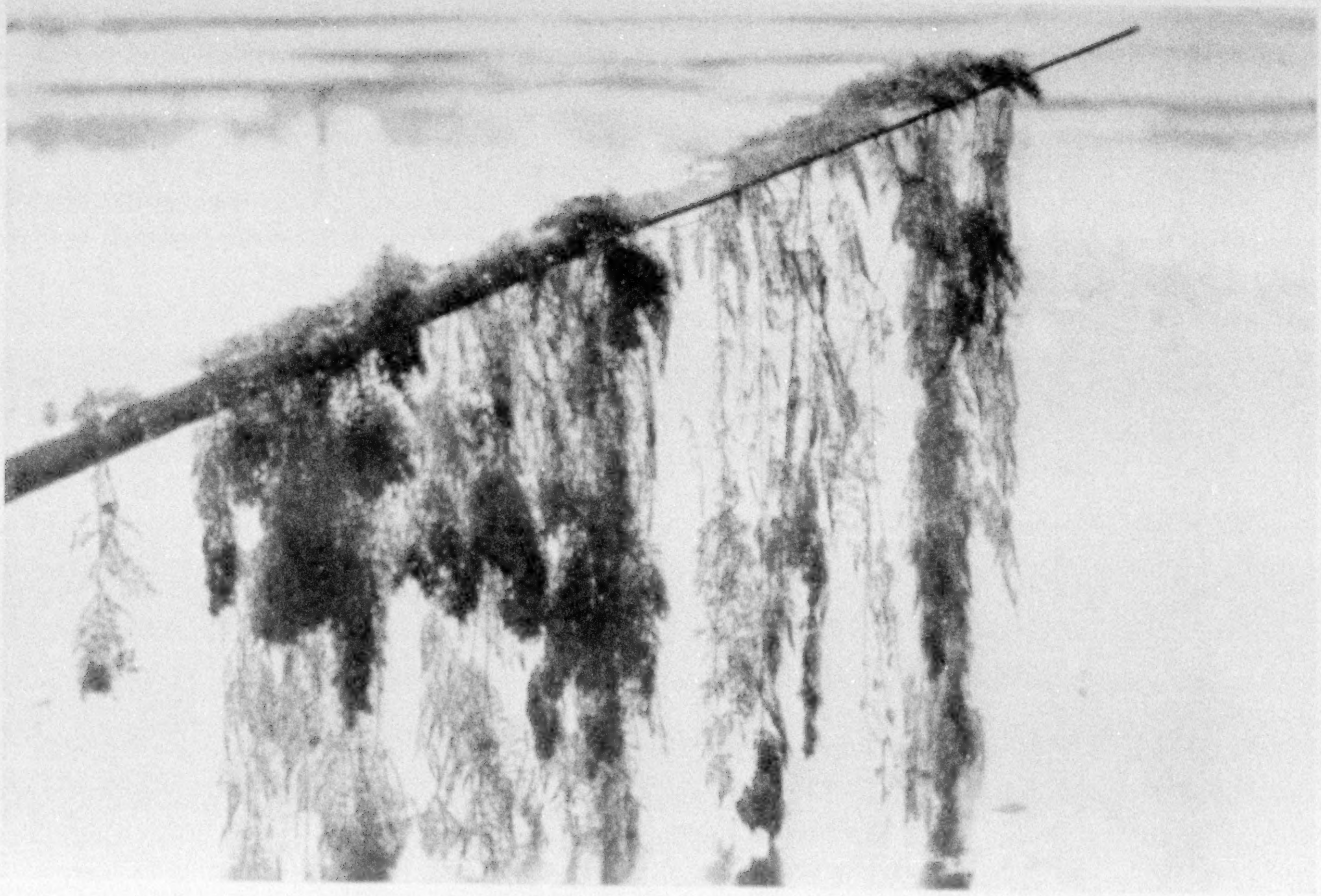
XUM

A FULL-BLOWN BLOSSOM OF THE BIG YELLOW YONCOPIN LILY

AN AREA COVERED WITH YONCOPIN LILY PADS

This American equivalent of the Egyptian Lotus is the chief flower of Reelfoot Lake.

A FIELD OF YONCOPIN LILIES



VEGETATION WHICH HAMPERS MOTOR BOATING ON REELFOOT LAKE

Water milfoil (*Myriophyllum*) grows profusely in the northern part of the lake.

XUM

birds. In the early-settler days the Elk was an abundant resident of the surrounding country, but has been extinct here for nearly 75 years. During recent years the Black Bear has followed the Elk, and now the Virginia Deer has been almost extirpated.

Some few Beaver and Otter are still to be found in the swamp areas, while the Raccoon, Opossum, Mink, Muskrat, Gray and Flying Squirrels are common.

The king of the lake fish is the Alligator Gar, growing to a length of eight feet, and this species is closely followed by the bulky, though picturesque, Spoonbill Catfish. Other fish in large variety and number are present, including such famous game fish as Crappie and Bass. They swell the population of the waters to such an extent that anglers from far and near make Reelfoot the mecca of an annual pilgrimage.

Snakes are much in evidence in summer. The commonest of the swimming snakes is the Water Moccasin, which glides through the water with surprising swiftness and grace, while along the banks, in some quiet sunlit spot, may be found the thick-bodied and repulsive Stump-tailed Moccasin, which disdains to move its clumsy body aside for the passage of man or beast.

Natives say that this creature possesses some mysterious power which enables it to make its presence felt, and, according to them, "though the hunter's feet and eyes may be following a squirrel among the tree-tops, he is suddenly brought to a rigid halt in time to withdraw the foot which would next have been placed on the back of one of these venomous reptiles."

### A PRIMEVAL MONSTER OF THE DISMAL SWAMPS

Most primeval of the lake's aquatic monsters is the Alligator Terrapin, or Loggerhead, which is found in holes or deep places in the swamp. Imagine a creature with moss-covered shell, thick as armor plate, as big as a washtub, and surmounted by horny scales not unlike those of the extinct Glyptodon, with huge feet bearing heavy claws, a head as large as that of a ten-year-old boy, snapping its powerful jaws, hissing and leaping at curious tormentors, and you have a picture of this denizen of the dismal swamps. The mouth consists of a hooked bill, closing over a lower one with such power and force that a stick as large as one's wrist is readily snapped in two.

The reptiles, batrachians, and insect forms have been studied only very briefly and casually, and here lies a rich opportunity for the naturalist and student of science to investigate the animate life of the Reelfoot Lake region, which is as diversified as it is extensive.

### THE NIGHT RIDERS' WAR

Some 15 years ago the State of Tennessee, realizing the value of Reelfoot Lake as a source of revenue, made it a fish and game preserve.

The trappers and settlers along the lake considered it free to all, and especially to those who had lived and settled along its borders. They resisted the right of the State, and the night riders' war of 1908 began. It culminated in October of that year, on the banks of the lake, in an attack on Quentin Rankin and Judge R. Z. Taylor, two prominent lawyers representing the landowners of that section. During the attack Rankin was hung on the banks of the lake and Judge Taylor, who was seventy years old, escaped by diving into the Bayou de Chien, and, through a fusillade of shots, swam and crawled through the lake marshes to safety.

The whole country side was implicated, and after the sheriff finished serving warrants there were not enough men left in the lake region to get in the winter supply of firewood.

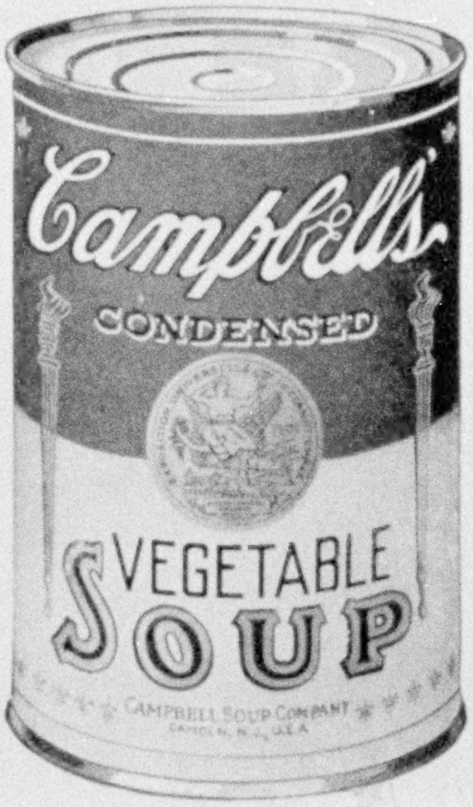
But once more the Reelfoot region is peaceful. The fish industry is thriving and the sportsmen throng the settlements of Samsburg and Walnut Log during the duck-hunting season.

The inhabitants make their living by fishing, and there is seldom a day when less than 2,000 pounds of fish, mostly the famous Reelfoot Crappie, are not shipped to the markets. During the fish season the daily shipments go as high as 5,000 pounds. Along with the Crappie are found the Gars, the Bream, and the large blue Channel Catfish, often weighing 30 to 50 pounds.

Here, in the heart of the United States, on the east bank of Reelfoot, is one of the few remaining primitive spots in the country.

SOUP MAKES THE WHOLE MEAL TASTE BETTER

# Eating soup every day has become a national habit!



Better food
Better appetite
Better digestion
Better health

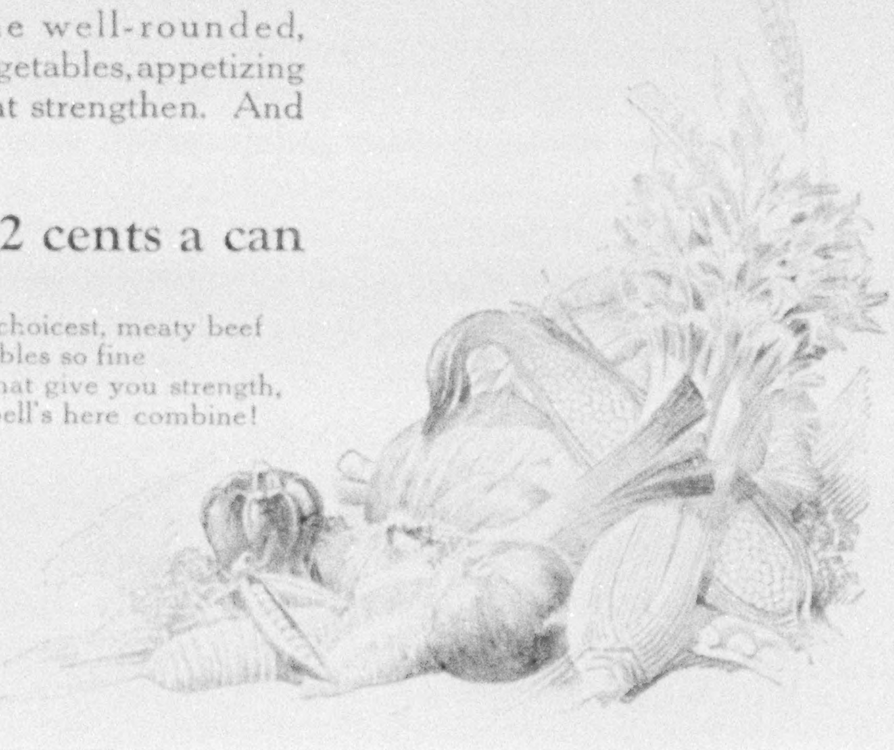
Because Campbell's offer such delicious soups in such convenient form that everybody everywhere can get and enjoy them, they have taught America to eat soup daily.

People eat soup regularly with their meals and you often find that soup is the principal dish at luncheon or supper or for the impromptu meal.

A plateful of Campbell's tempting and hearty Vegetable Soup, for example, is an ideal combination of the different foods that make the well-rounded, healthful meal—15 vegetables, appetizing beef broth, cereals that strengthen. And the taste!

21 kinds 12 cents a can

Broth of choicest, meaty beef
Vegetables so fine
Cereals that give you strength,
Campbell's here combine!



**Campbell's Soups**

LOOK FOR THE RED-AND-WHITE LABEL

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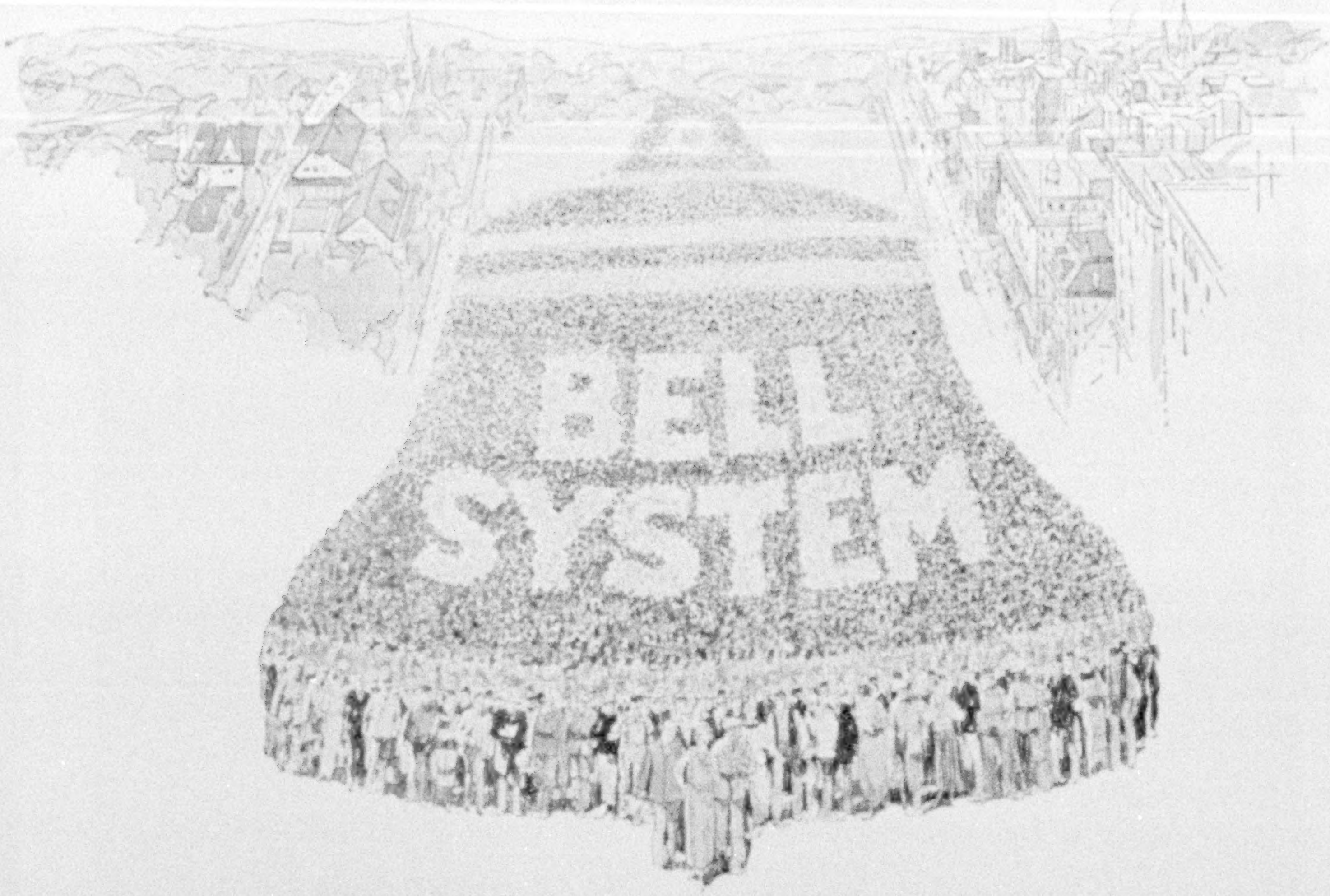

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There is the web of wires. The many switchboards. The maze of apparatus. The millions of telephones. All are parts of a country-wide mechanism for far-speaking. The equipment has cost over 2 billion dollars, but more than equipment is needed.

There must be the guardians of the wires to keep them vital with speech-carrying electrical currents. There must be those who watch the myriads of tiny switchboard lights and answer your commands. There must be technicians of every sort to construct, repair and operate.

A quarter of a million men and women are united to give nation-wide telephone service. With their brains and hands they make the Bell System live.

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Photo by Fairchild Aerial Camera Corp.

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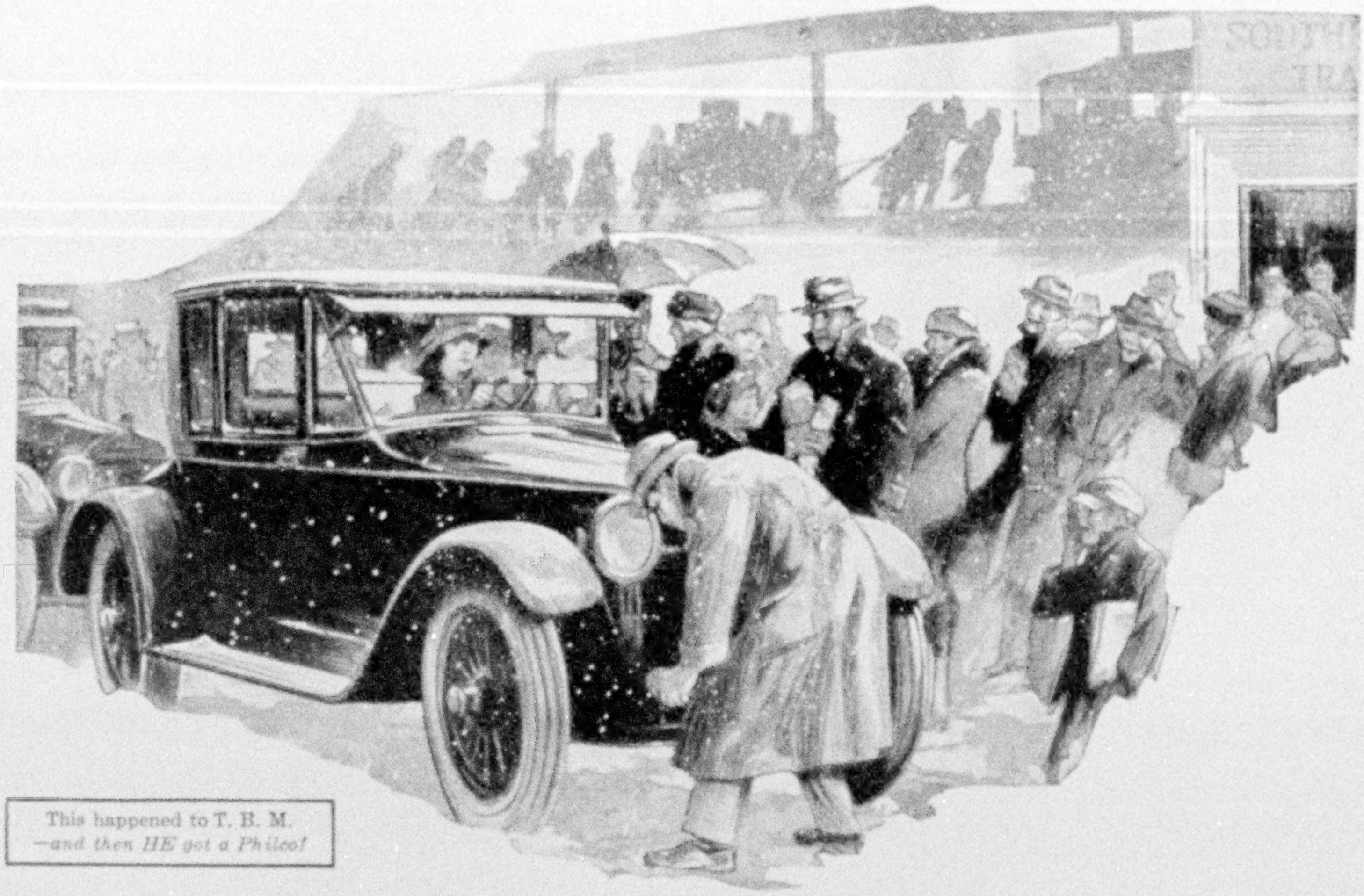
BONDS SHORT TERM NOTES ACCEPTANCES



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*—and then HE got a Philco!*

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But after this he got *his* Philco—the full-size, full-powered, guaranteed battery that whirls the stiffest engine—that protects you from the embarrassments, and perils of battery failure.

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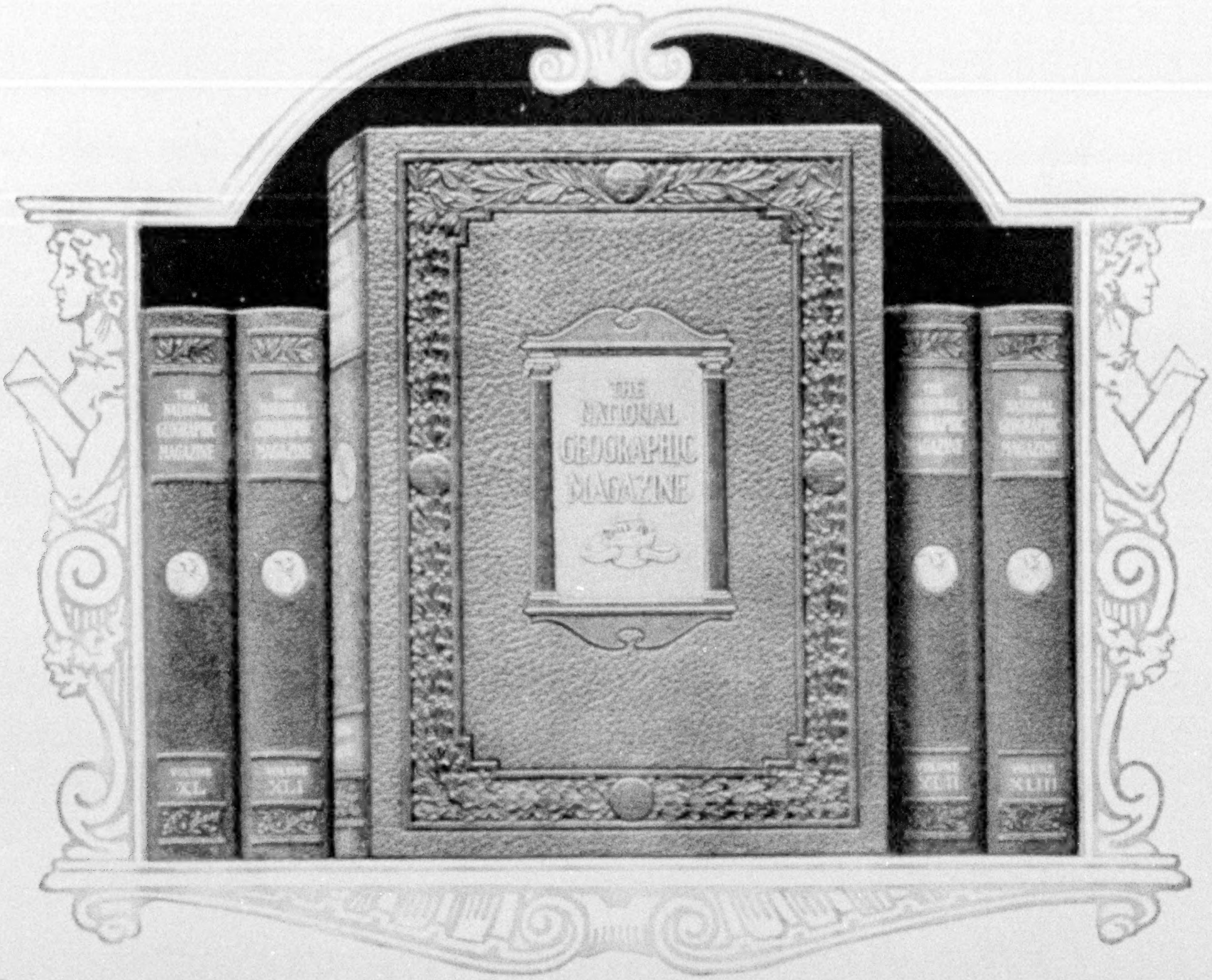

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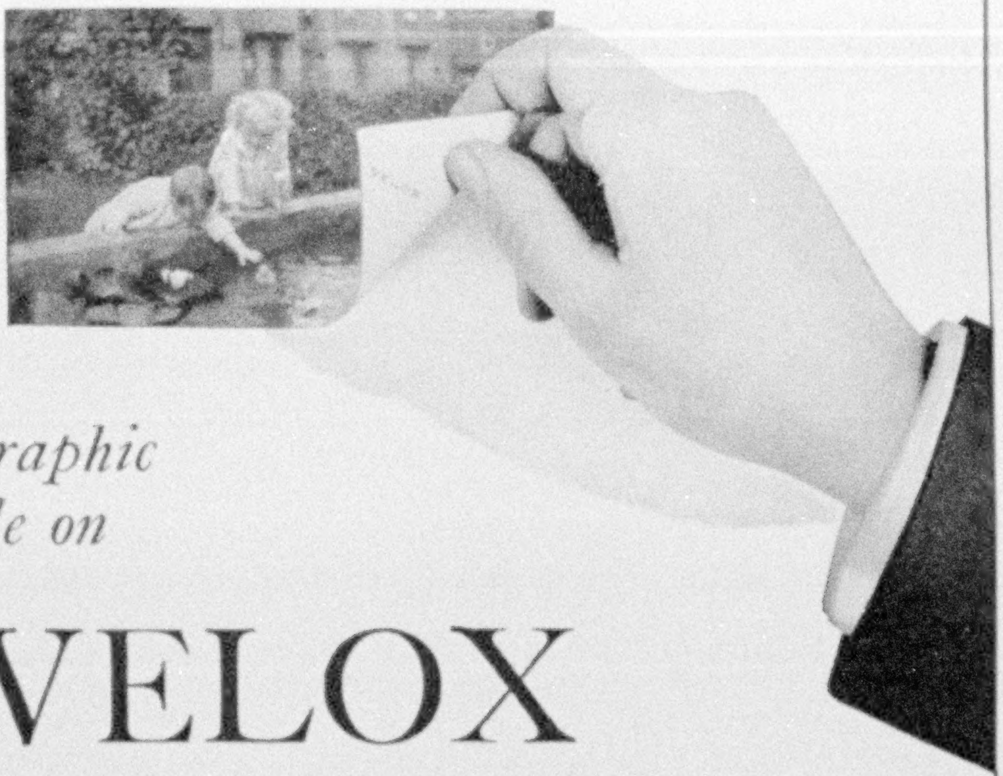

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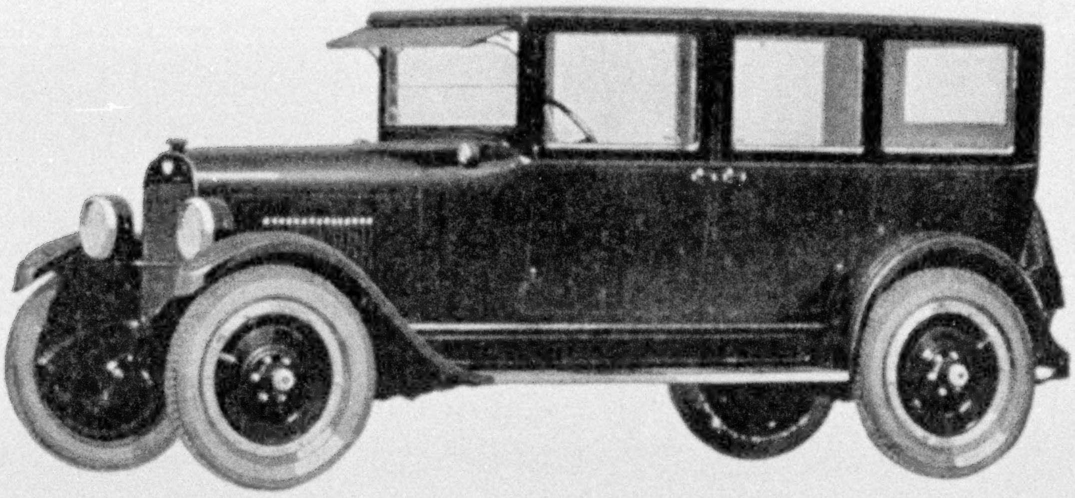

Could there be a finer car for the family—for the man and wife everywhere who have long promised themselves a car of their own—than this beautiful good Maxwell Sedan?

A car that brought to America a new interpretation of European beauty.

Obviously superior—not only in performance and reliability and economy, but presenting an ease and comfort far above the usual in its class.

Seating arrangements very ample, with cushions and back rests positioned for greatest comfort. Unusually long springs impart superior riding qualities.

Ease of driving emphasized by soft clutch and brake action; almost effortless steering.

Upholstery in granite weave. Woodwork in walnut. Hardware in satin finish, with pleasing and unobtrusive design. Yale lever locks; Yale key locks on doors.

Standard equipment includes disc wheels and non-skid cord tires front and rear, cowl ventilator, heater, windshield visor and wiper, rear view mirror, parking lights and dome lights.

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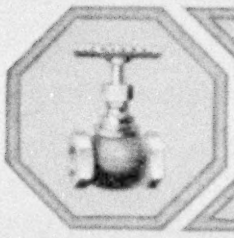
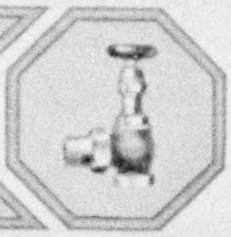
In the new Crane kitchen sink shown here, there is a full-size laundry tub under the removable drain board. For washing delicate fabrics or for regular use, a laundry tub close at hand has many advantages.

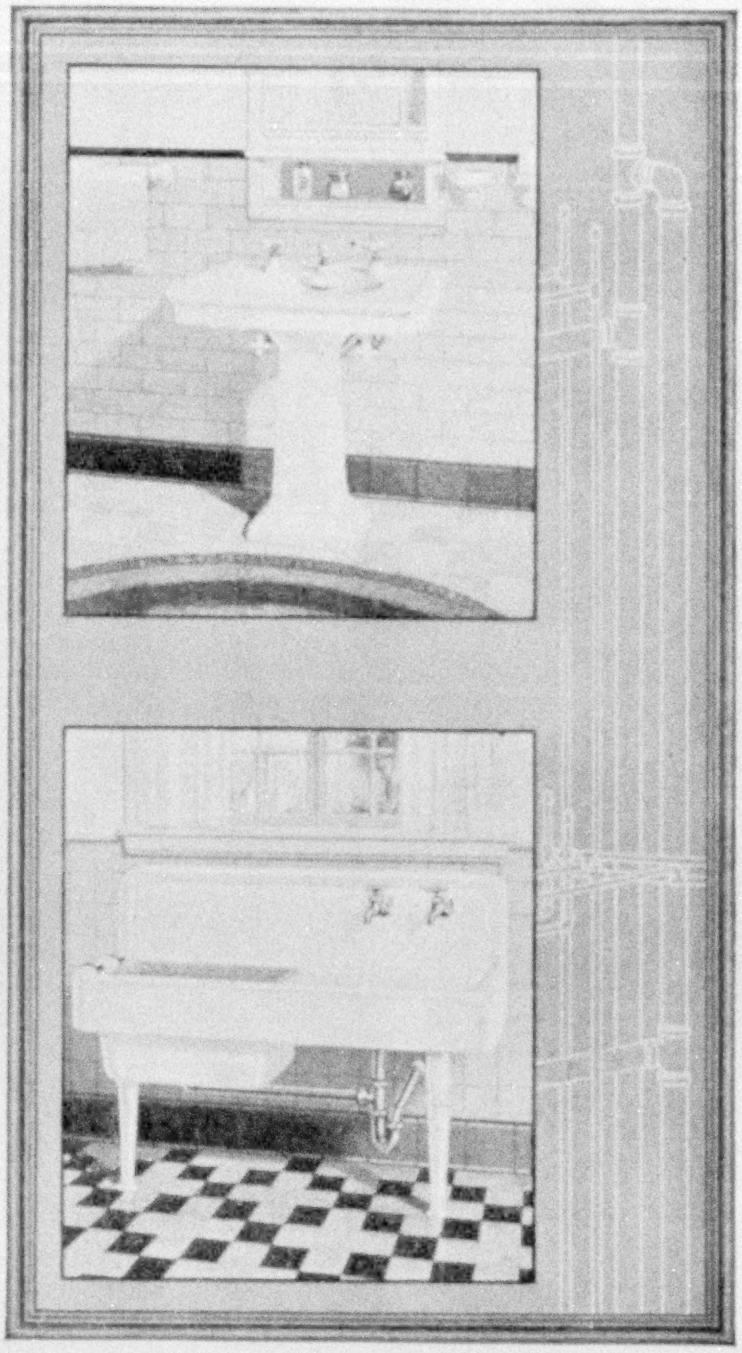
Comfort as well as convenience marks the design of the "Nova" lavatory pictured above. Its spacious top is 30 inches broad while its deep basin is 13 by 18 inches. Your architect or plumber can easily get you any Crane fixture made.

*Globe Valve No. 1-B*



*Radiator Valve No. 220*





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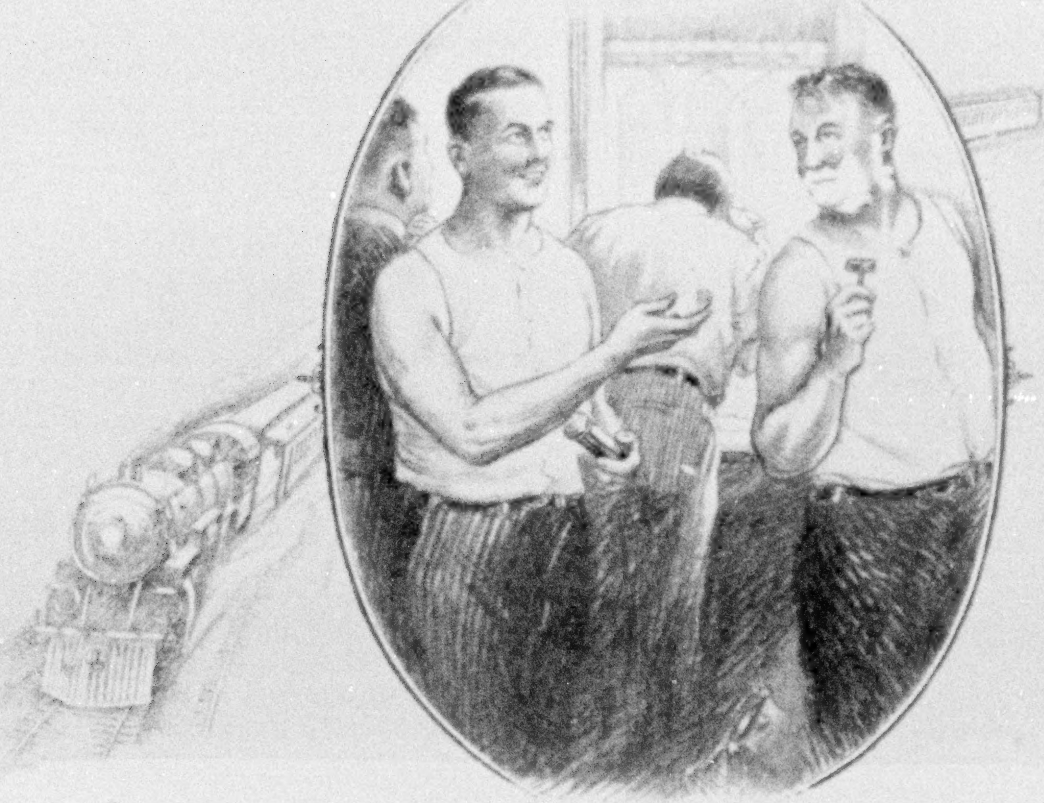
# COLGATE'S

## Shaving Stick

### "HANDY GRIP" AND REFILL



"I have used all the preparations on the market, and Colgate's 'Handy Grip' Shaving Stick beats anything else I have ever tried. It is wonderful. The first time I lathered with it I thought I had a new razor."

Name on request.

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SHAVING STICK

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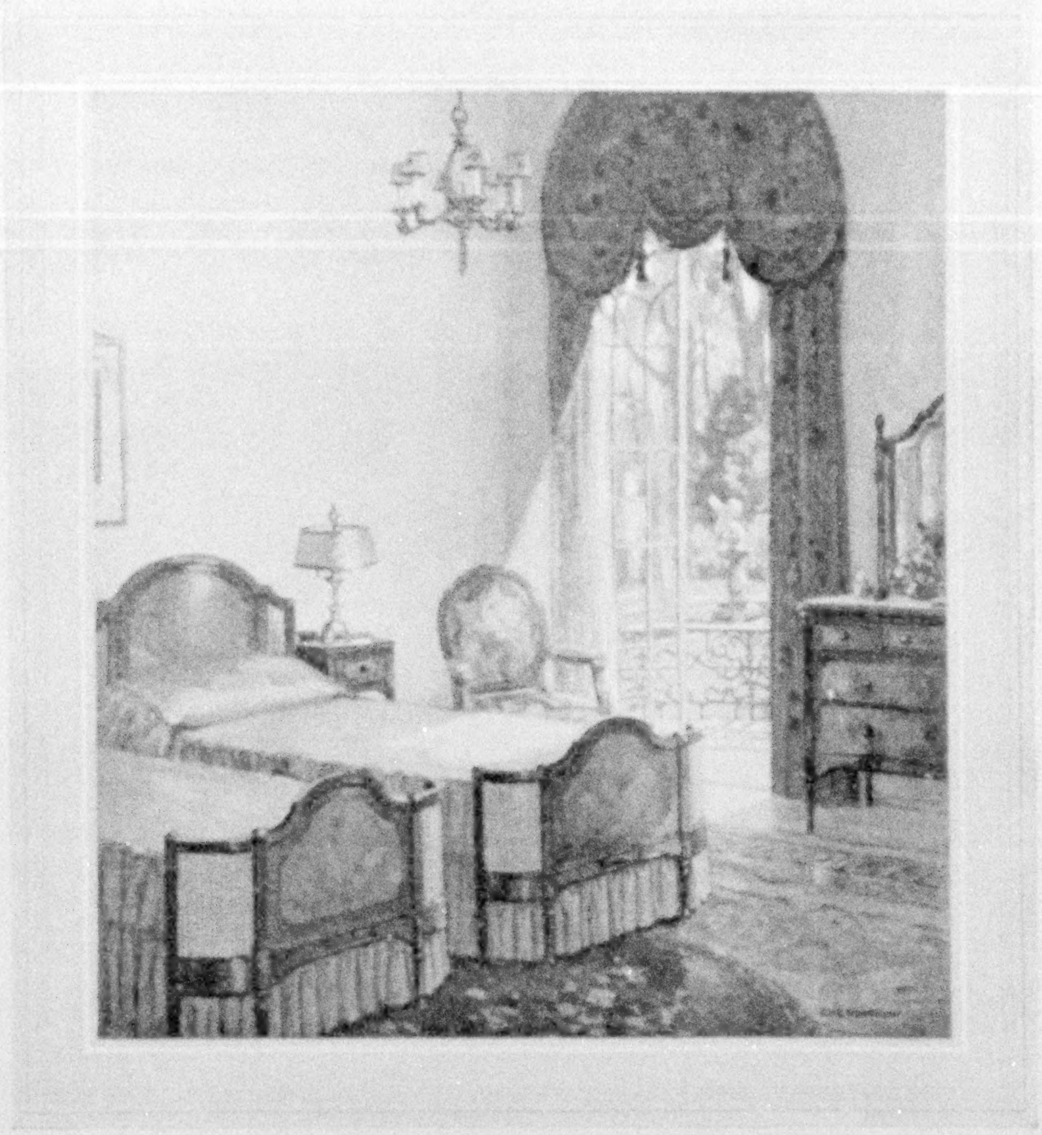

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Science at last has found the real meaning of dreams. Experiments at Harvard and elsewhere prove that we dream *only* when we are partly awake. The deeper we sink into the quiet slumber that restores tired bodies, weary brains and tense nerves, *the less we dream.*

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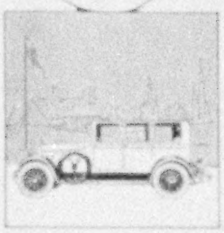

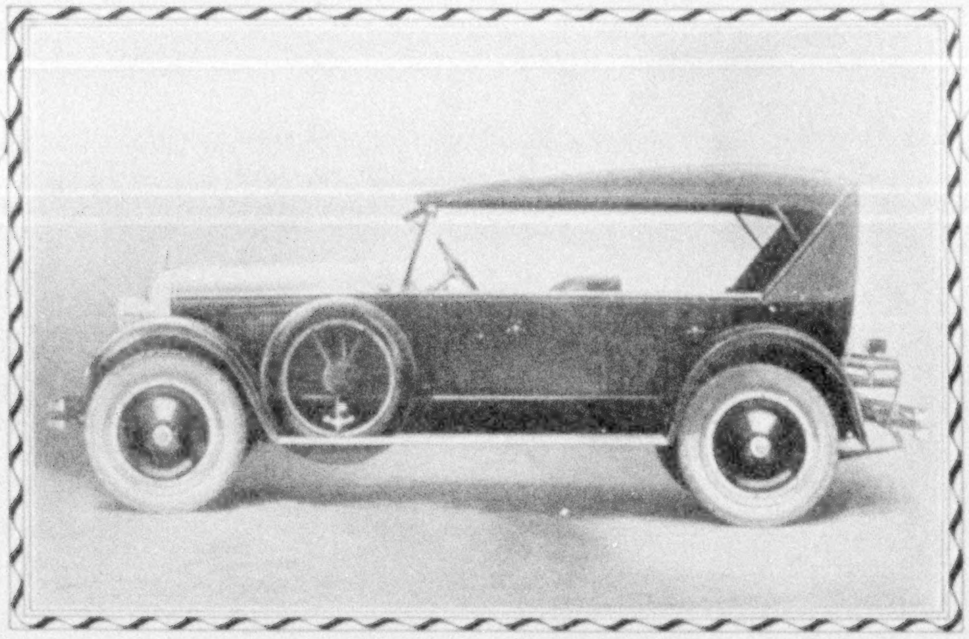

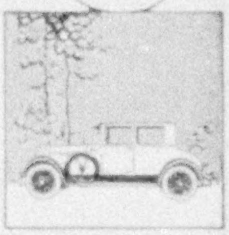

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More money will not buy a roomier car. Nor will it buy a more comfortable car, for Paige has the 131-inch wheelbase, the 5-foot spring suspension, the balance, that give utmost comfort.

### *Never Before So Fine a Paige*

You know Paige as a large, able, comfortable, well-built car. Finer each year, say those who know it best. And the new Paige goes a step further. It is not only finer—but immensely greater value.

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Think of what it means to have a car that will do 70 miles an hour. Such a reserve of power means you can climb hills in high when others shift and stall—dash ahead of the crowd—means a motor you will never hurt by overtaxing.

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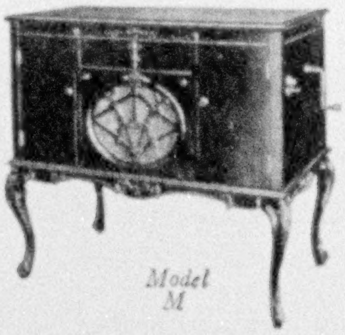

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*Rose Specialists* Box 8, West Grove, Pa.

**Guaranteed to Bloom**

# Men Who Care

## For whiter teeth are now fighting film

Wherever you go among careful people you see teeth that glisten now. Millions of people every day combat the dingy film.

This test will show you how. The results will amaze and delight you. Make it, for your own sake, now.

### Those dingy coats

Film is that viscous coat you feel. Much of it resists the tooth brush, clings and stays. Soon the film discolors, then it forms dingy coats which hide the luster of the teeth.

Film also causes most tooth troubles. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Germs breed by millions in film. They, with tartar, are the chief cause of pyorrhea.

Few people escaped these troubles. So dental science has found two ways to daily fight that film. One acts to disintegrate the film, the other to remove it without harmful scouring.

After many careful tests these methods were adopted. A new-type tooth paste was created to apply them daily. The name is Pepsodent. Now leading dentists the world over are urging its adoption.

### Watch its effects

Pepsodent also multiplies the alkalinity of the saliva as well as the starch digestant in saliva. Those agents are there to constantly fight acids and digest starch deposits on teeth. Every use of Pepsodent gives them manifold effect.

Thus Pepsodent does essential things which old ways cannot do. The results are quickly seen and felt. No one can doubt the benefits they bring.

Send the coupon for a 10-Day Tube. Note how clean the teeth feel after using. Mark the absence of the viscous film. See how teeth become whiter as the cloudy coats disappear.

Once learn this way to whiter, cleaner, safer teeth and you will always want them. Cut out coupon now.

### Protect the Enamel

Pepsodent disintegrates the film, then removes it with an agent far softer than enamel. Never use a film combatant which contains harsh grit.

PAT. OFF.
**Pepsodent**
REG. U.S.

*The New-Day Dentifrice*

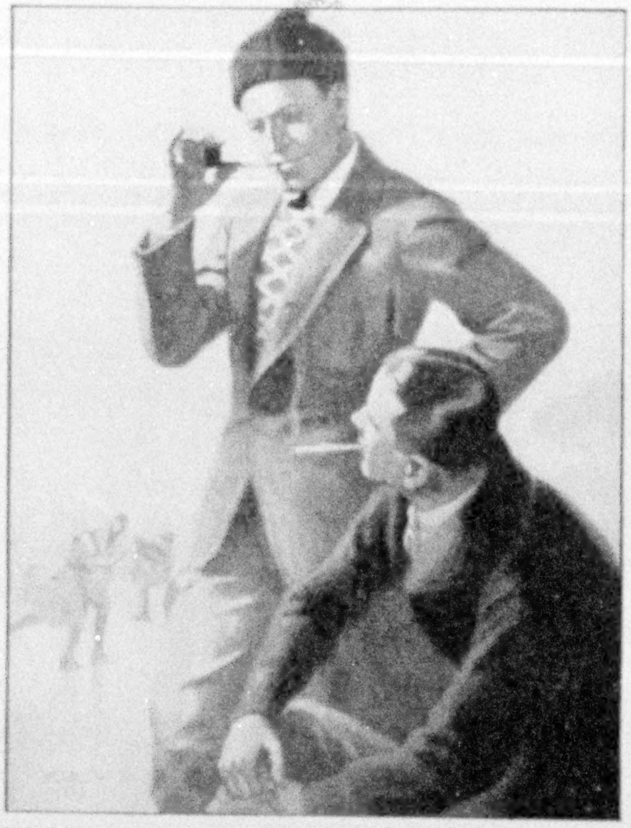
Now advised by leading dentists
the world over.

### 10-Day Tube Free

1307

THE PEPSODENT COMPANY,
Dept. 563, 1104 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

Only one tube to a family



# BAKELITE

## For a comfortable winter-time smoke

When the mercury is hovering close to zero you will find it makes quite a difference whether the mouthpiece of pipe or holder is made of genuine Bakelite, or of a chill-absorbing, brittle substance.

This unique material is unaffected by cold. It is tough, serviceable, and in its golden shades, has all the beauty of purest amber. It is tasteless and non-absorbent.

The best known makes of pipes and holders are made with mouthpieces of Bakelite. See them in the nearest smoke shop.

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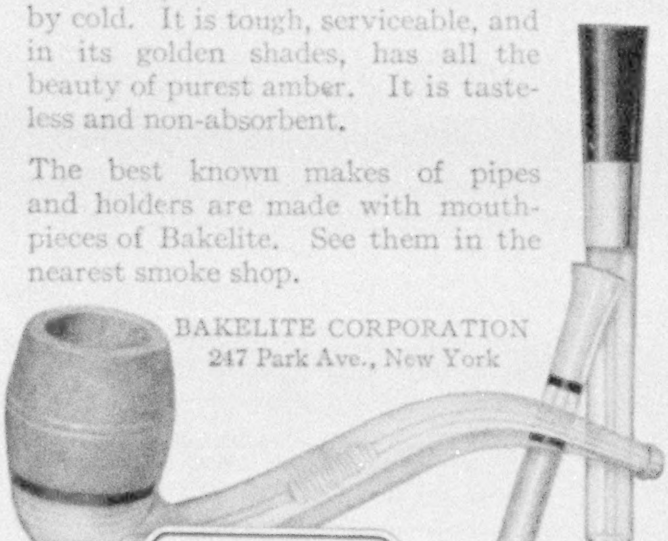

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*REDMANOL*
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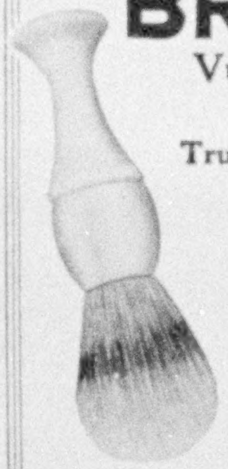
# BRUSHES

## Vulcan Rubber Cemented Shaving Brushes



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**Boston, U. S. A.**
Brush Manufacturers for Over 114 Years
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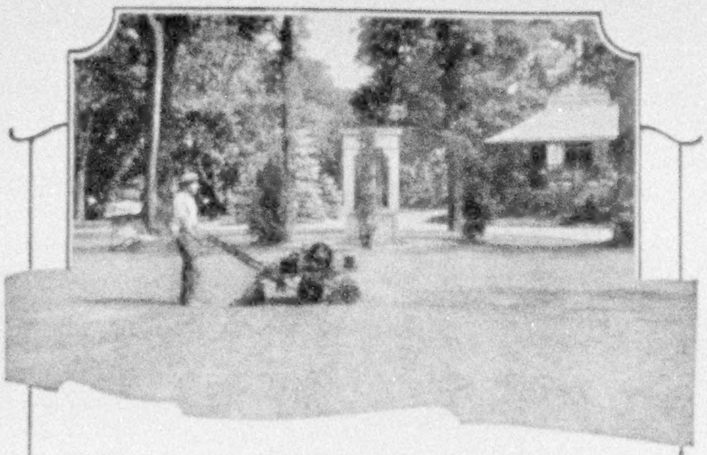

The cost of mowing your lawn just once by hand will pay for four or five mowings with an Ideal Power Mower. The labor saved in a season frequently pays for the Ideal.

The Ideal rolls as it cuts, producing a carpet-like lawn that hand mowers cannot duplicate. It can be operated by an inexperienced man, is sturdy and will last for years with ordinary care. One of our three models will exactly meet your requirements. Write for literature.

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# DODGE BROTHERS

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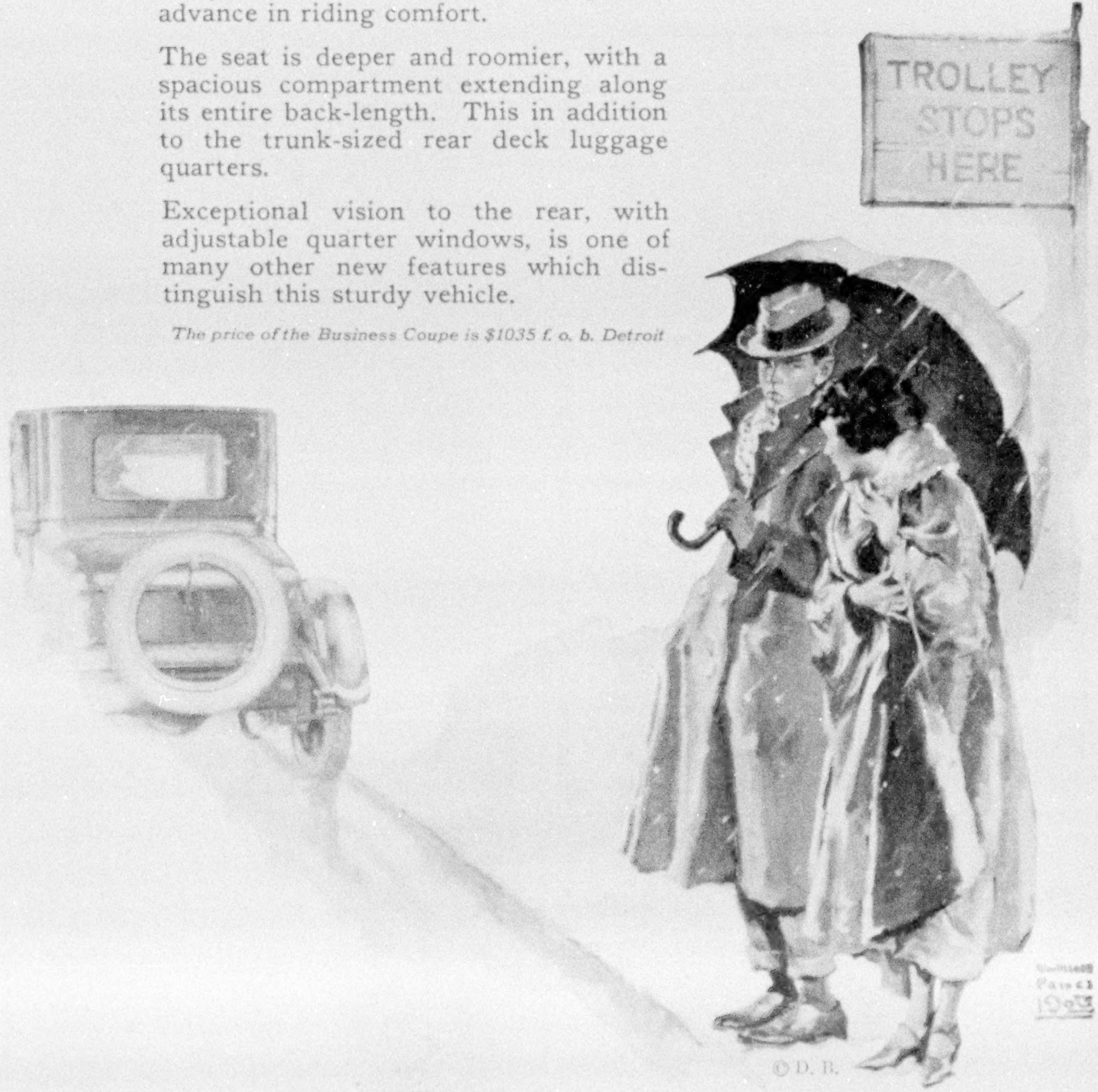

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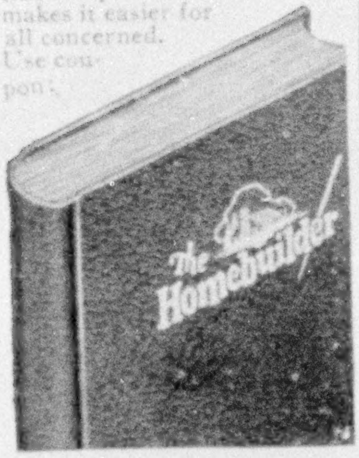

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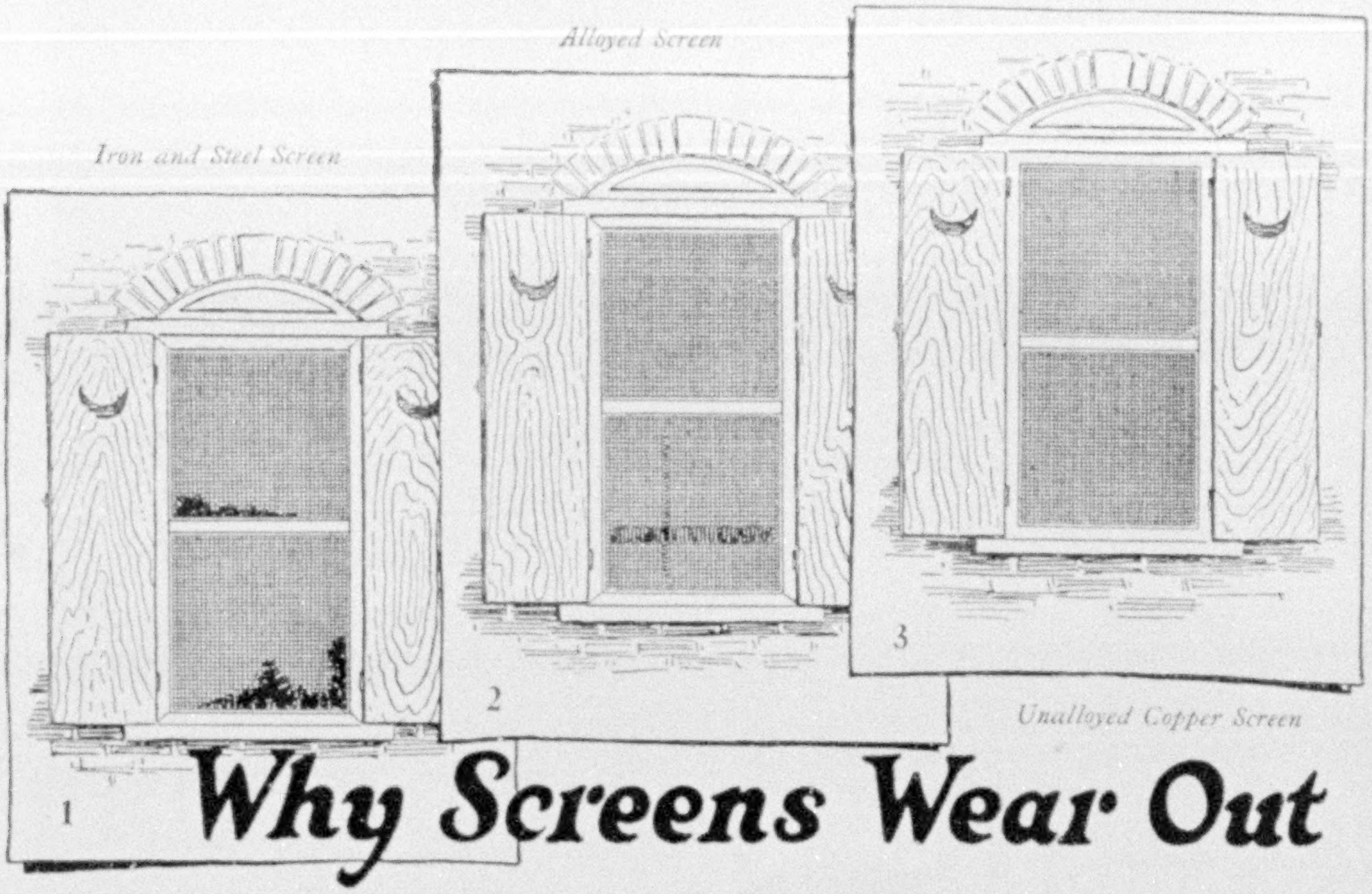
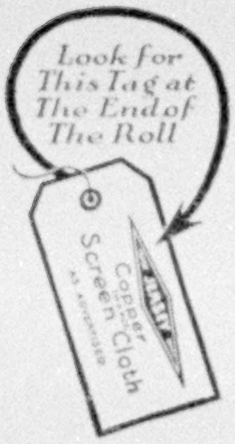


# Why Screens Wear Out

When you are buying door or window screens bear these facts in mind—

1. Insect screen cloth made of iron or steel inevitably rusts quickly along the bottom of a screen—where moisture collects—and soon becomes useless.
2. Insect screen cloth made of *alloys of copper*—copper and tin (bronze), copper and zinc (brass)—is often of uneven quality and some of the wires will disintegrate long before the others. A screen with an opening large enough to admit flies and mosquitoes is little better than no screen at all.
3. Insect screen cloth made of pure, high grade copper, produced by the Roebling process, cannot rust, is of uniform quality throughout and is unusually stiff and strong. Under like conditions it will outlast any of the other metals by many years.


Look for This Tag at The End of The Roll
JERSEY
Copper Screen Cloth

Jersey Copper Screen Cloth is made from wire which is 99.8% pure copper. By a special Roebling process this wire is given tensile strength and stiffness comparable to that of steel. It makes a screen cloth which will lie flat without stretching or bulging.

It gives unequalled service under the most severe conditions, such as the hot, moist climate of the tropics or near the seacoast.

Screen with Jersey Copper next spring. Use 16 mesh (coarser will admit mosquitoes) and the dark finish which is almost invisible.

If you cannot readily obtain Jersey Copper Screen Cloth in your locality, write us. We will send you on request a booklet, "A Matter of Health and Comfort," regarding screen cloth which you will find worth reading.

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**Screen Cloth**

JERSEY

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Living room, dining room, 2 bedrooms, kitchen, bath. 4 other plans, some with pantries, dining alcoves, grade and inside cellar entrances. Get free Aladdin Catalog.

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Aladdin catalog contains seven different plans of this house; some with inset porches, grade and inside cellar entrances, two and three bedrooms.

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Large living room, dining room, kitchen, pantry, three bedrooms, clothes closets, bath. Semi-open staircase and rear porch. Four-bedroom plan with grade cellar entrance at same price.

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Typical American home with exposed rafters, shingled gables, and plenty of window ventilation. Grade cellar entrance, three bedrooms, four clothes closets and large bath.

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Dutch Colonial with full ceilings first and second floors. 14' x 22' living room, large dining room, kitchen, three bedrooms, bath, linen and clothes closets; grade cellar entrance.

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Dutch Colonial for wide inside lots or narrow corner lots. Full ceiling heights entire second floor, sewing room, columned and inset front entrance.

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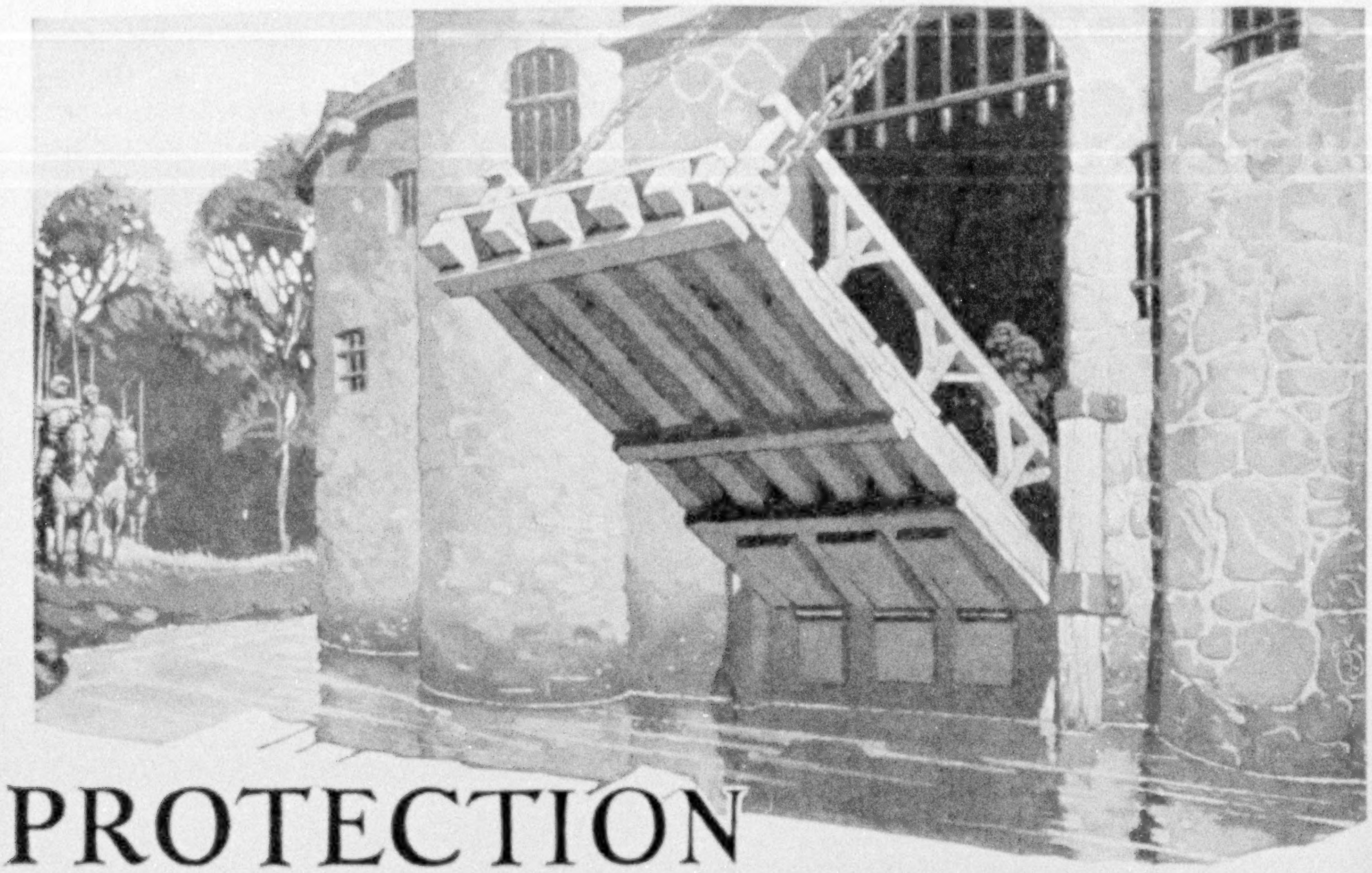
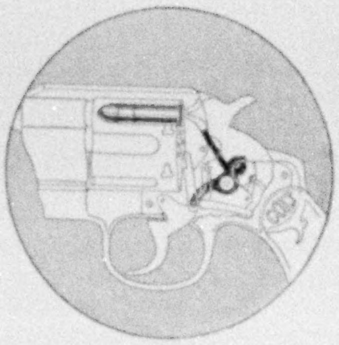


# PROTECTION

SHELTERED behind castle walls several feet thick! Guarded further by ancient moat and clumsy drawbridge! How primitive this protection appears today compared with the absolute security afforded millions of homes by the modern Colt—Revolver or Automatic Pistol.

Safe to handle—quick in action—always sure and accurate in fire—small wonder that Colt's fire arms are the choice of the government and its citizens.



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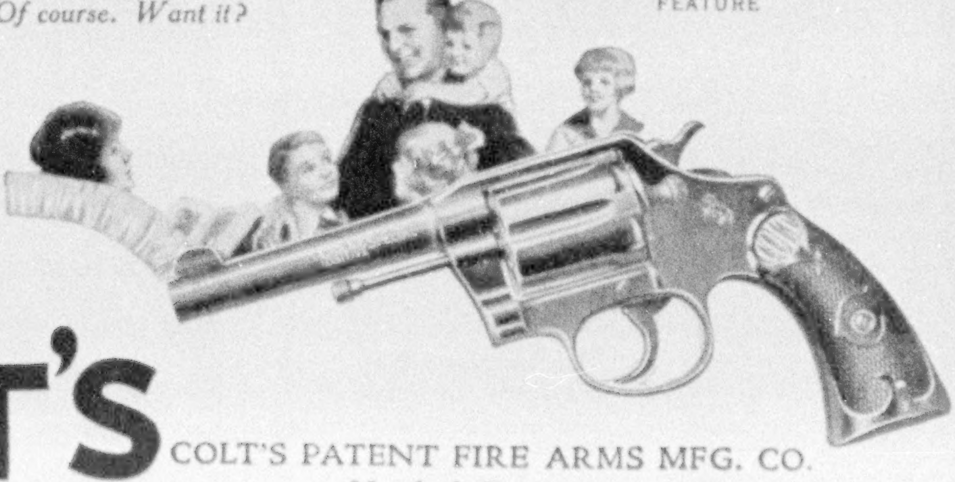

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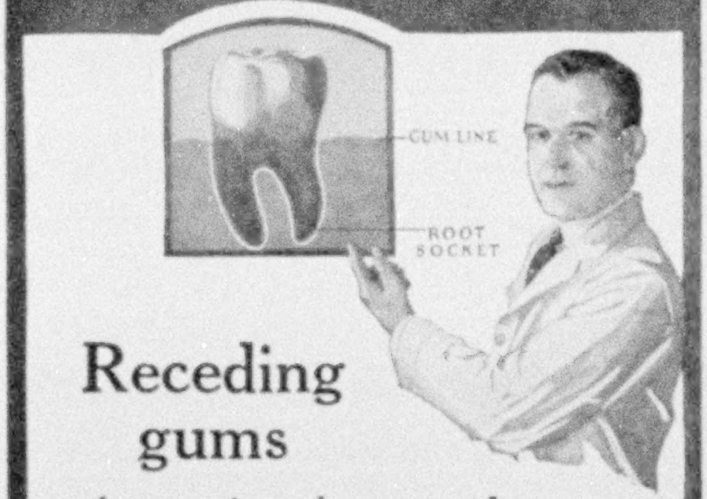
PYORRHOCIDE
POWDER
*keeps the gums healthy*



**Receding gums**

*A warning that pyorrhea may attack the root sockets*

YOUR teeth may be white and free from decay, but you will lose them if pyorrhea—starting *under the gum line* where you cannot see it—spreads to the root sockets. When your root sockets are affected, the entire support of the teeth is weakened. The teeth usually become loose and fall out, or must be pulled.

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PYORRHEA
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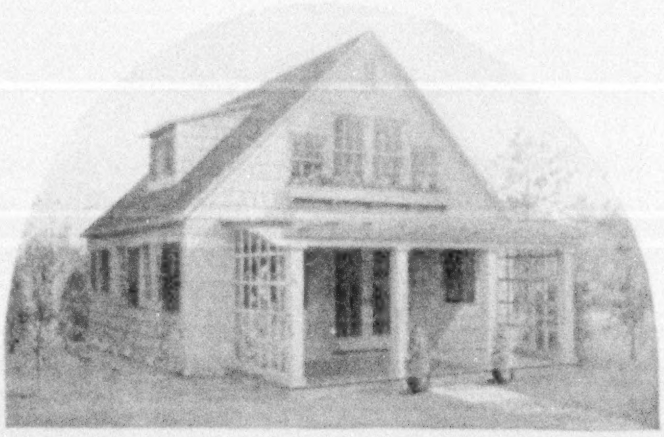

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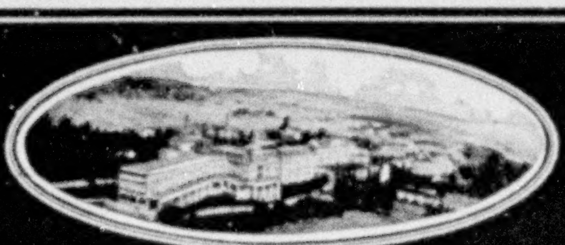

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IT MAY be a house of vain regrets if you do. Plate Glass is so much more beautiful—you will always wish you had used Plate Glass in the windows.

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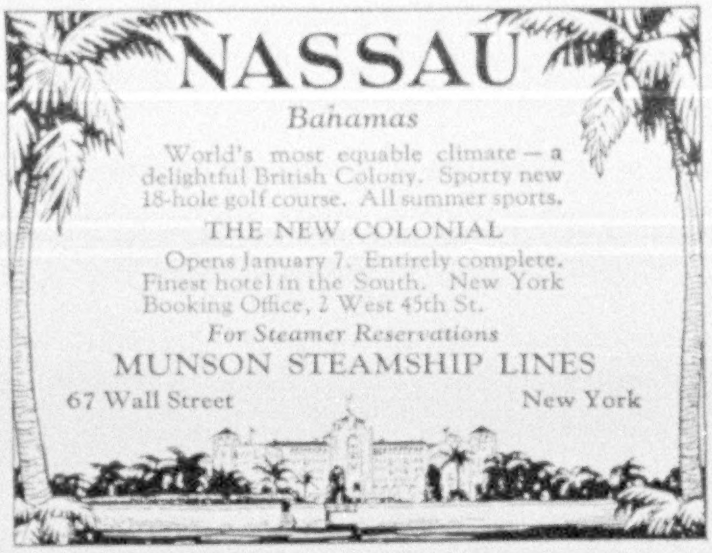

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*Name and Address of Nominating Member*

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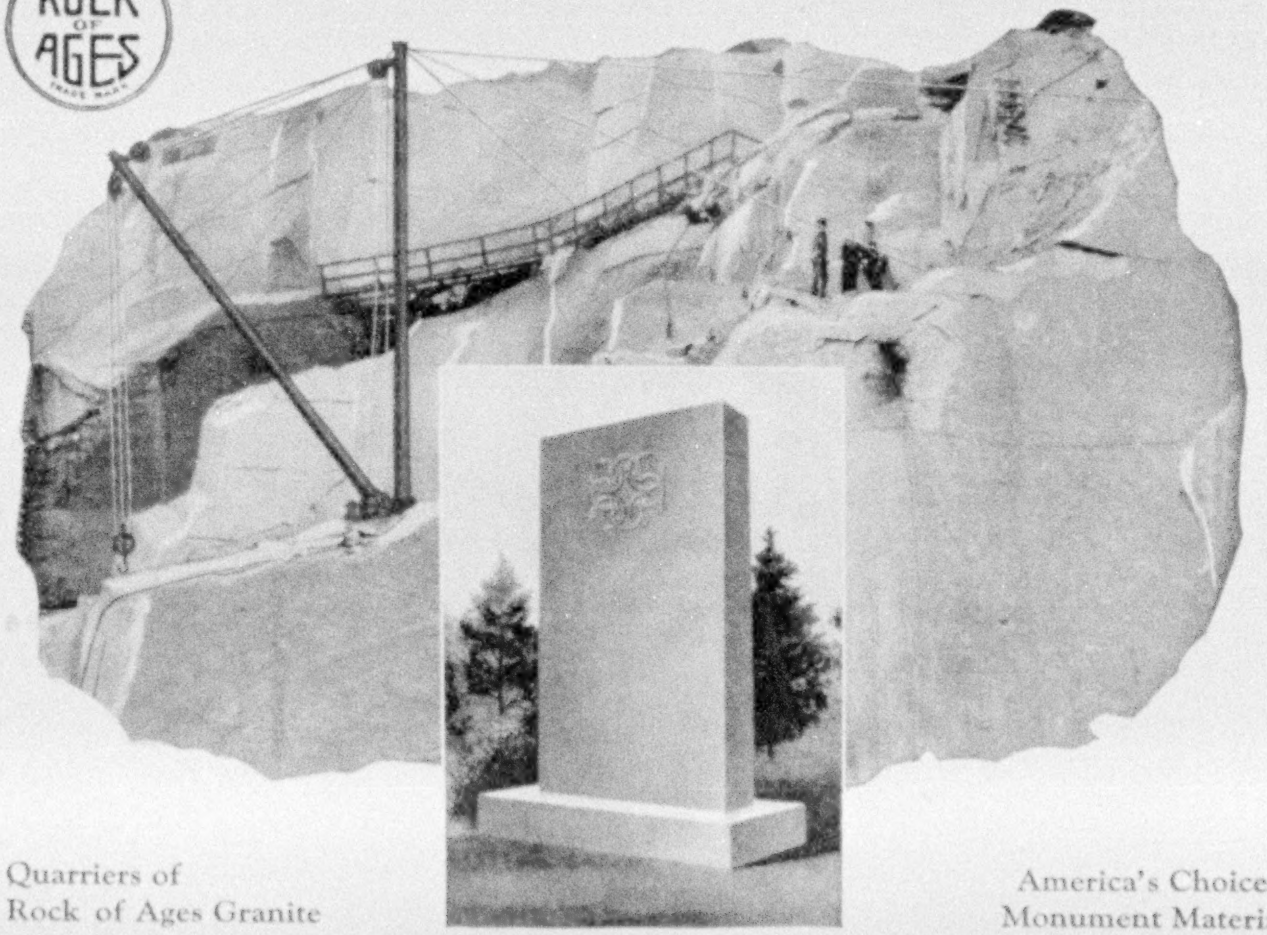

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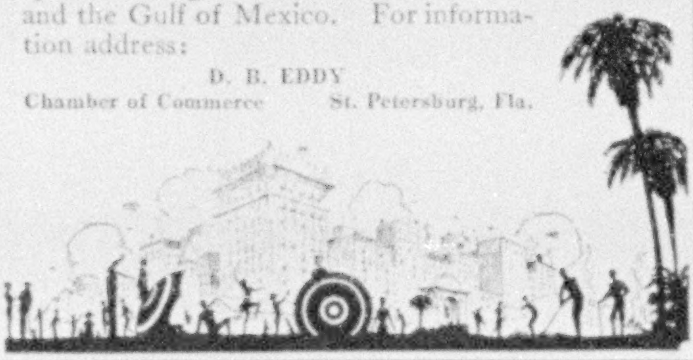

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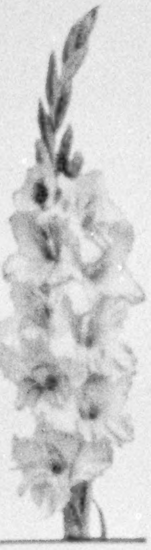
**Kunderd**
***Gladioli***



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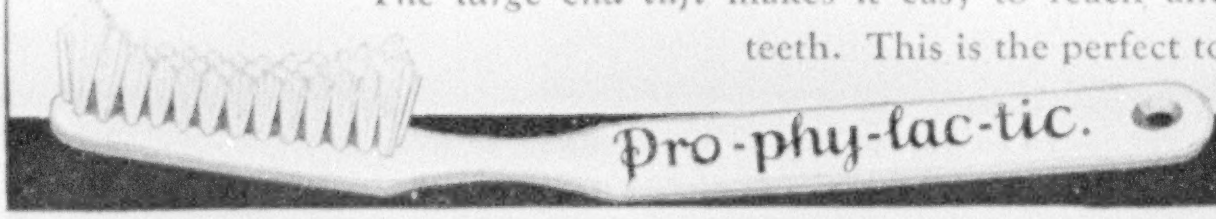
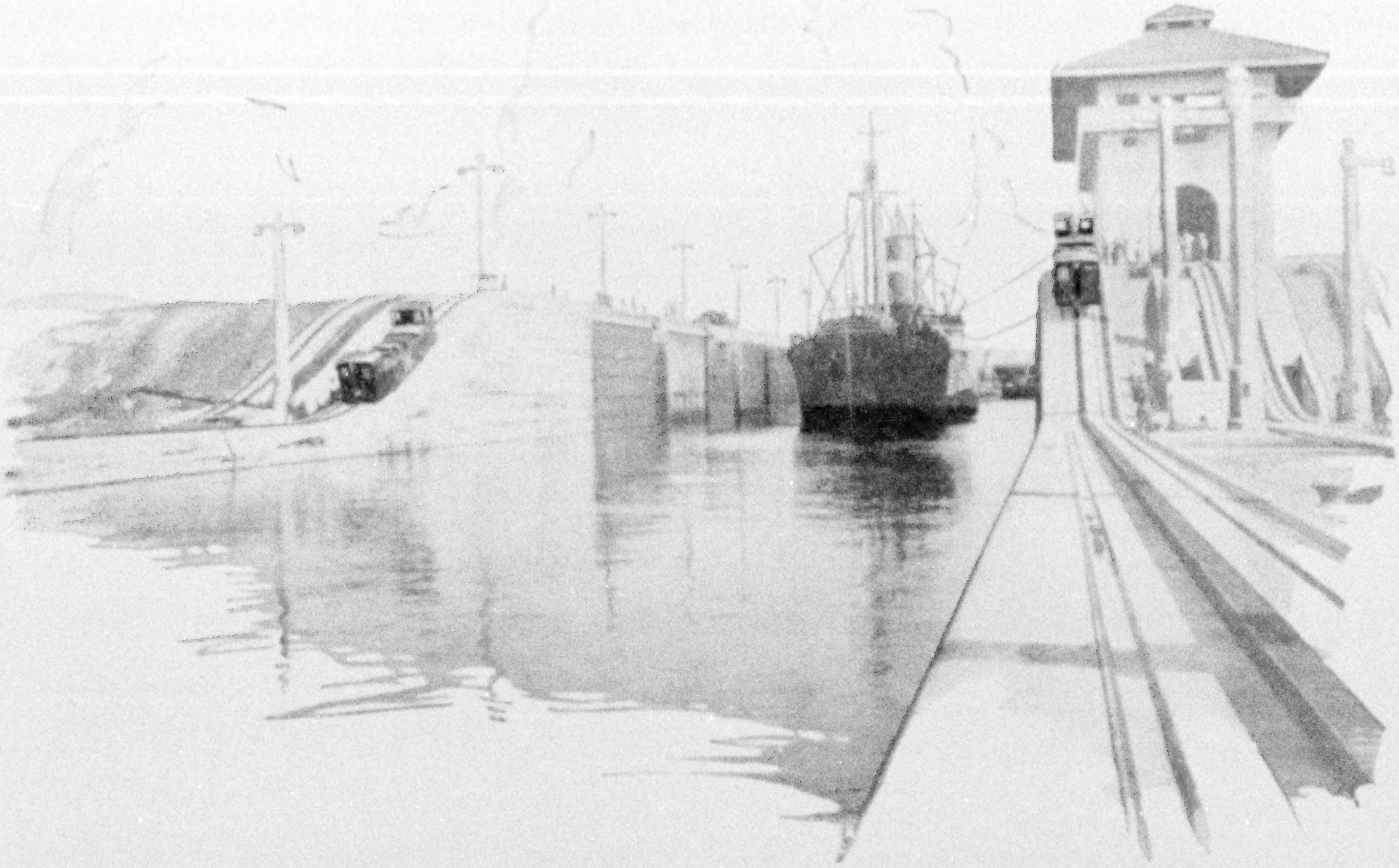
*The large end tuft* makes it easy to reach and clean all teeth. This is the perfect tooth brush.


Pro-phy-lac-tic.



# Eight thousand miles saved on every trip

It used to be 13,307 miles from New York to San Francisco by sea; it is now only 5,262.

The Panama Canal, which seemed such a heavy expense when it was built, is an immense national economy.

A greater economy because of the 1,500 General Electric motors which do its work—pulling the ships through, pumping water, opening and closing the locks—all at such a little cost.

To lighten human labor, shorten distance, and save money—these are the services of electricity. General Electric Company makes much of the apparatus by which electricity works, and stamps it with the monogram shown above.

## GENERAL ELECTRIC

## "The LaFayette is in a class by itself"

Gouverneur Morris

Like a goodly number of LaFayette owners, Gouverneur Morris is now driving his second LaFayette. So, when he writes thus of his motor car, he expresses a judgment that is mature and tempered by experience:

"Any fine modern motor car can be driven over level roads with safety and comfort a good deal faster than the law allows. Speed, therefore, should not be the first point of recommendation—they are all fast."

"But when the level road lifts and flings itself over a mountain chain, there is only one car that I know of, and I am familiar with most of them, which will continue to break the law if you keep the throttle wide open, and descending upon the other side of your mountain chain, there is only one car which, if you switch off the power, has sufficient compression to hold you safely, no matter how steep the grade, without a touch of the brakes."

"Upon all those points of driving which go to make an owner safe, comfortable and proud, it seems to me that the LaFayette is in a class by itself. It hugs the road. It does not side lash. It sits down behind to sudden emergency braking instead of humping up. Its weights are perfectly distributed. In one city block it will pick up from nothing to a dazzling rate of speed. It is seldom necessary to shift its gears. It is easy on tires. It is not greedy of gas and oil. It has miraculous springs. Roads which I had considered rough until I owned a LaFayette seem smooth to me now."

"Beautiful motors of all makes came here to Del Monte last month for the golf championship. But the new LaFayette roadster which had just been delivered to me was much more beautiful to look at than any of them. No matter how long it might stay parked outside the golf club or over at Pebble Beach, there was always a crowd around it."

Steadily the conviction that the LaFayette is one of the world's finest motor cars is finding wider and wider acceptance as the experience of LaFayette owners becomes known.

LaFayette Motors Corporation, *Milwaukee*, Wisconsin

LAFAYETTE

Modern housekeeping demands it

In this country alone, The Hoover is beating, sweeping and cleaning an immaculate pathway across the rugs in more than one million two hundred thousand homes.

If you could look into these homes you would find this quiet machine doing all manner of things that now are robbing you of time and strength.

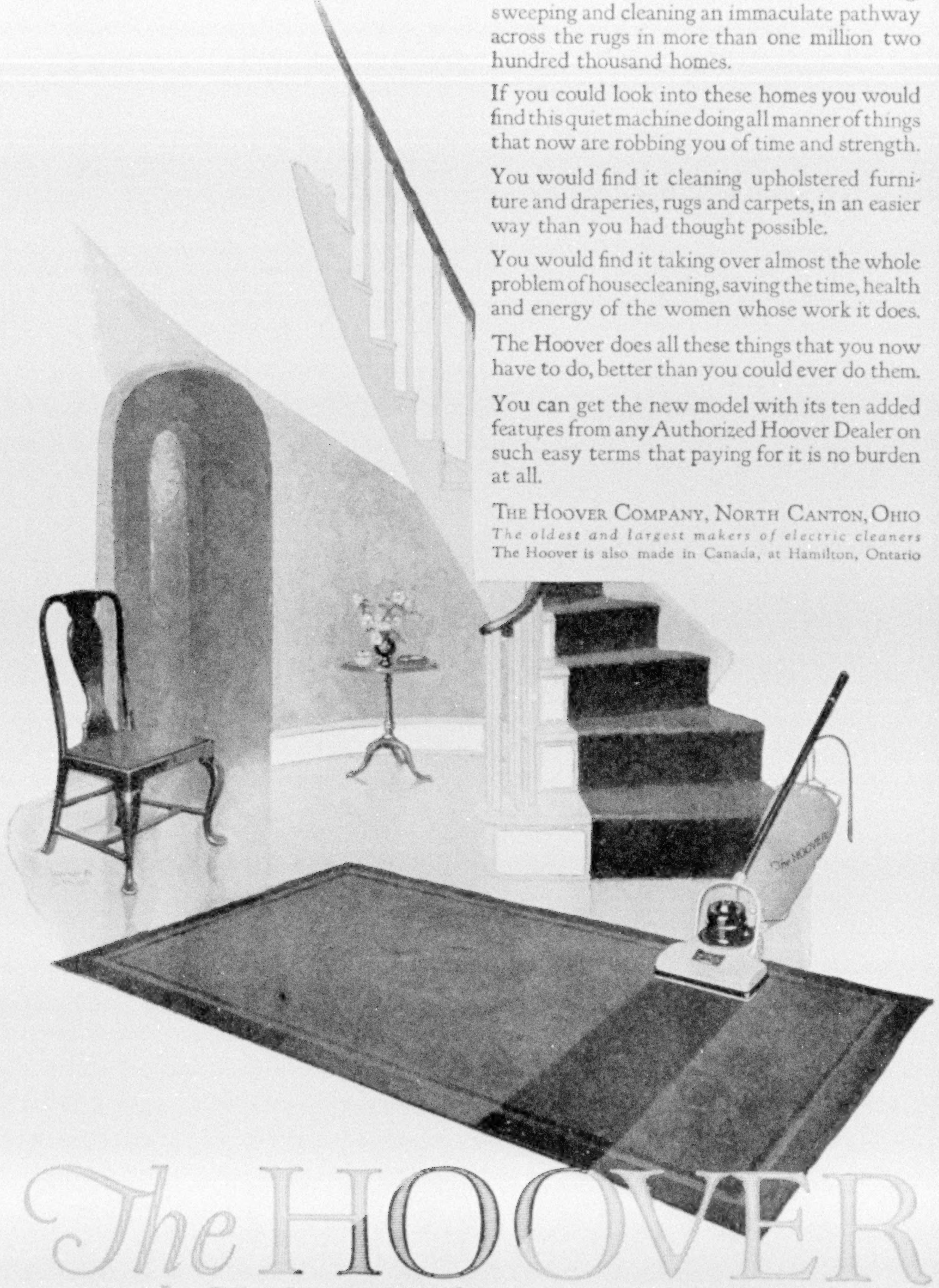
You would find it cleaning upholstered furniture and draperies, rugs and carpets, in an easier way than you had thought possible.

You would find it taking over almost the whole problem of housecleaning, saving the time, health and energy of the women whose work it does.

The Hoover does all these things that you now have to do, better than you could ever do them.

You can get the new model with its ten added features from any Authorized Hoover Dealer on such easy terms that paying for it is no burden at all.

THE HOOVER COMPANY, NORTH CANTON, OHIO
*The oldest and largest makers of electric cleaners*
The Hoover is also made in Canada, at Hamilton, Ontario



The HOOVER
*It BEATS ... as it Sweeps ... as it Cleans*

PRESS OF JUDD & DETWEILER, INC.
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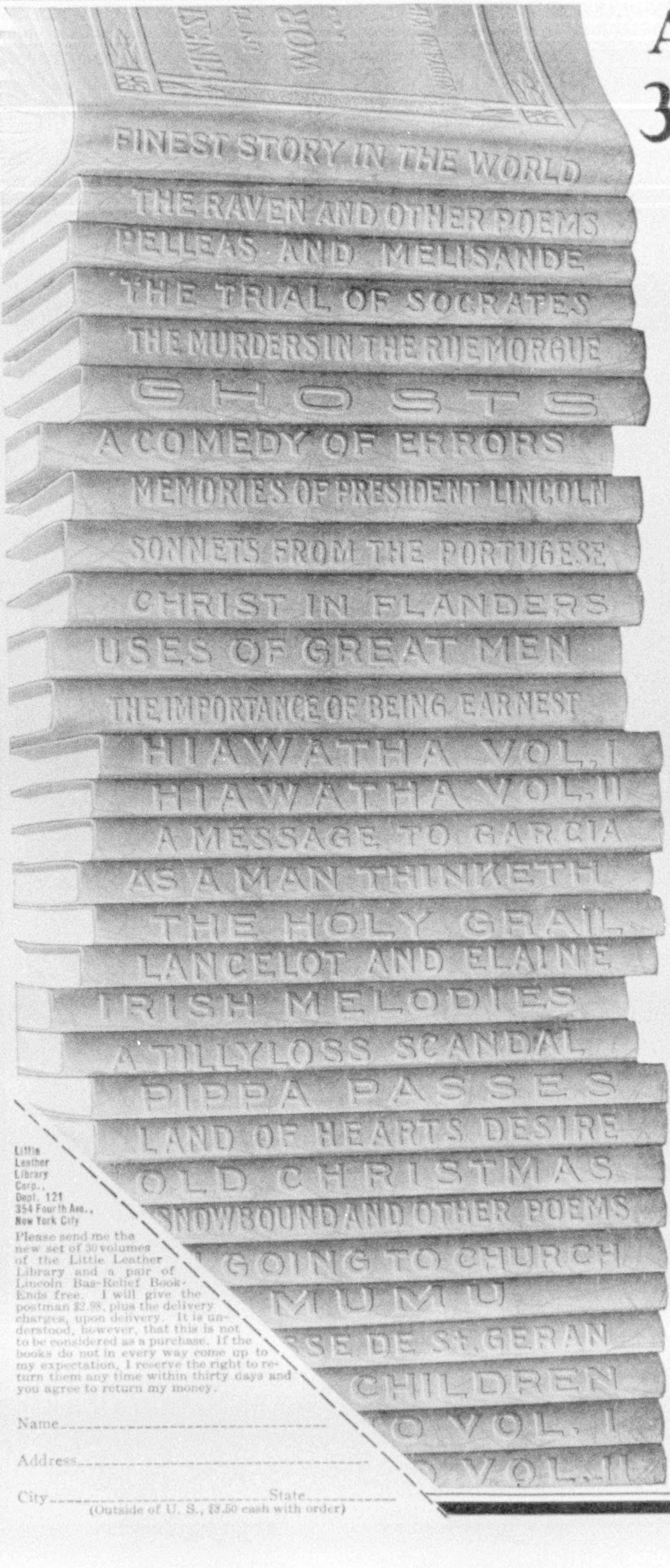
FINEST STORY IN THE WORLD
THE RAVEN AND OTHER POEMS
PELLEAS AND MELISANDE
THE TRIAL OF SOCRATES
THE MURDERS IN THE RUE MORGUE
GHOSTS
A COMEDY OF ERRORS
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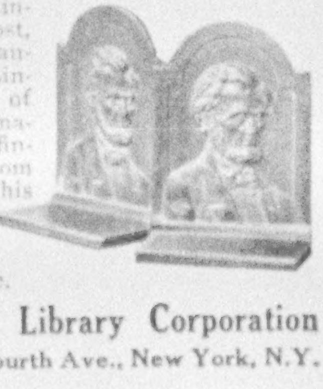

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